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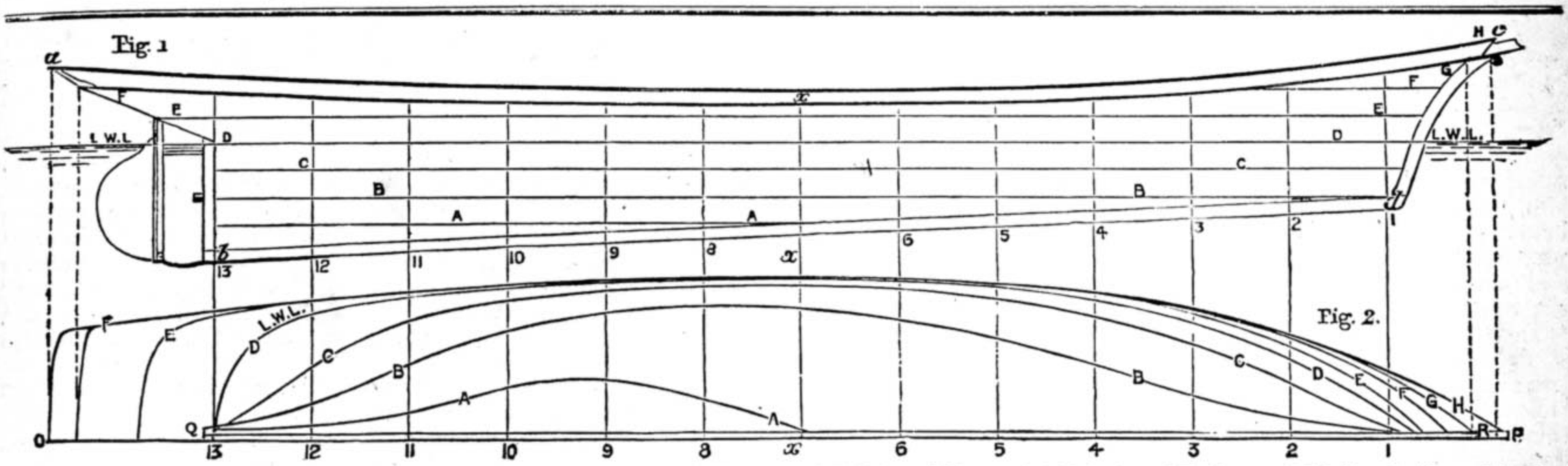

Fig. 1.—Sheer Plan of Steam Launch—*a c*, Gunwale; *a b*, Rebate of Stern; *c d*, Rebate of Stem; *b d*, Rebate of Keel; *x x*, Midship Section. Fig. 2.—Half-Breadth Plan. (Scale, ¼ in. to 1 ft.)

A SIMPLE METHOD OF BOAT DESIGNING.

BY EXPERTO CREDE.

IF it is true that a hare must be caught before being cooked, it is certainly true a boat must be designed before being built; and as there have been frequent requests already in WORK for directions as to boat building, it is evident that a few remarks on designing will not be out of place.

Boat designing and building will be found thoroughly interesting and all-absorbing hobbies. Winter is by no means the slack season of the year for the boating man. It is then he must design and build his craft, and it is then he scrapes his spars, splices and serves his ropes, and does many other little odds and ends about his boat. The cabin too has to be aired, and often and often does he camp with boon companions during the long winter evenings round the boat-house or cabin fire with the social pipe, when each in turn spins his yarns of past adventure, and the summer gone is brought back with more than life's reality. It is then one begins to think of summer weather

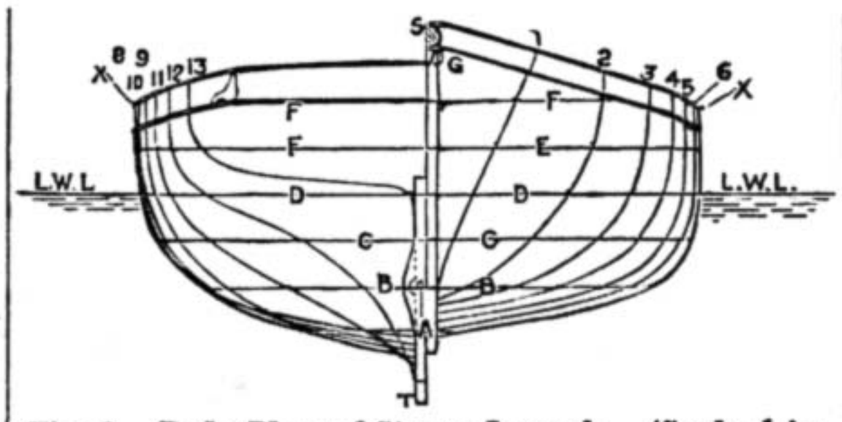

Fig. 3.—Body Plan of Steam Launch. (Scale, ¼ in. to 1 ft.)

and summer cruises to come, and one's mind naturally turns to the subject of the new craft. What will she be like? She has only

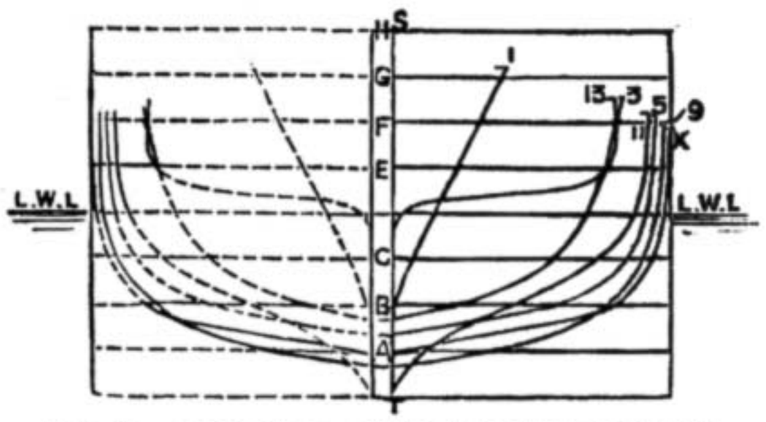

Fig. 6.—Body Plan of Model of Small Boat.

to be mentioned to be roundly discussed, and advice comes in on every hand; but we have our own opinions, and to carry them into execution is now the task before us.

In submitting the following suggestions, it must be noted at the outset that they are addressed to amateurs only, and as professed builders would not ask for assistance, it is assumed the requests before mentioned come from the former class of readers. Boat designing as well as boat building are matters about which there need be no real difficulty, and the reader may be encouraged when he is told that the methods here indicated have been successfully adopted by the writer in actual practice.

It is not intended to plunge into ship-building with all the science of a modern naval architect, nor, on the other hand, shall we, like the builders of old, follow the "blind rule of thumb," trusting to the "rack of the eye"; but by steering a middle course and preparing a model of our own, we shall hope—without making the study wearisome or the work laborious—to enable the reader to turn out a presentable craft for his own pleasure and recreation.

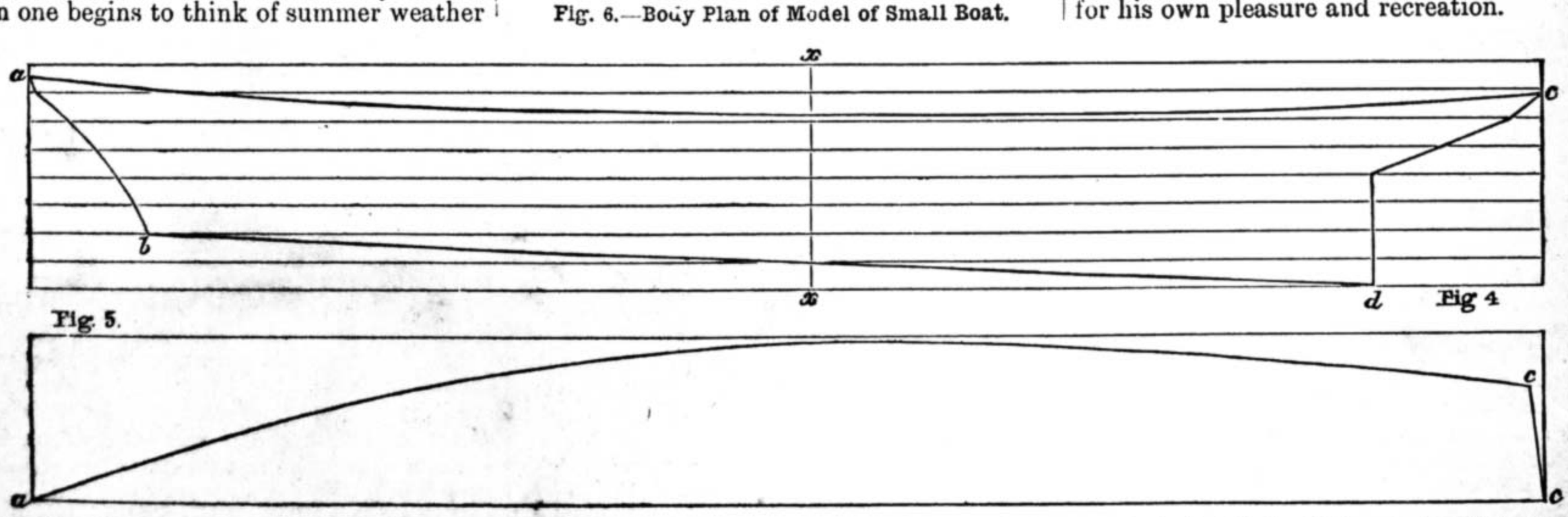

Fig. 4.—Sheer Plan of Model formed of Pieces of Wood glued together, showing Rebate of Stem (*a b*), Gunwale (*a c*), Rebate of Stern (*c d*), Rebate of Keel (*b d*), and Midship Section (*x x*). Fig. 5.—Half-Breadth Plan of Model, showing Gunwale (*a c*) and Stern (*c c'*). (Scale, ¼ in. to 1 ft.)

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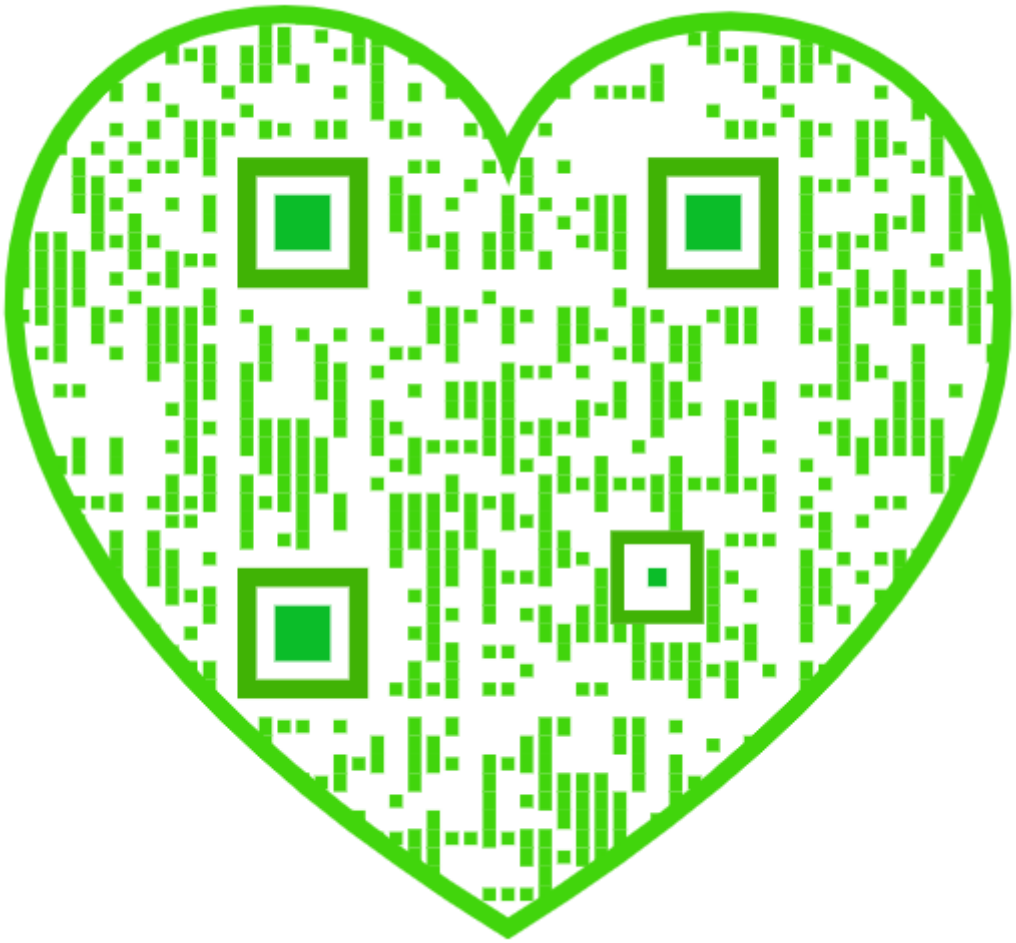

In the following remarks, therefore, and by the aid of diagrams, it is intended to lay before the reader a simple and ready method of preparing a design for any class of boat he may desire to have built; and for our present purpose a small steam launch of about 27 ft. has been selected.

Then to work: The design for a boat is properly shown in three separate plans or drawings: the sheer plan, the half-breadth plan, and the body plan, as set forth in Figs. 1, 2, and 3; and these are drawn on a scale of ¼ in. to the foot to bring them into the limits of the page of WORK; but readers can easily enlarge them, and enlargement to a scale of 1 in. to 1 ft. is strongly recommended both for clearness' and practice' sake.

The sheer plan gives the length and depth of the intended boat; the half-breadth gives length and breadth; while the body plan gives breadth and depth; so that, as will readily be seen, we have the length given in two plans, viz., in the sheer and half-breadth; the breadth given in two plans, viz., in the half-breadth and body plans; and the depth in two plans, viz., in the sheer and body plans.

Take the sheer plan first:—Here the straight line marked L W L is the load water line or surface of the water when the boat is floating, and the straight lines parallel to this both above and below are called water lines. These water lines are shown in the same way in the body plan; but in the half-breadth they are represented by curved lines. The water lines constitute, in fact, a number of horizontal sections whose shapes are shown by the curved lines in the half-breadth plan. In the sheer plan a general side view of the boat is given, showing the outlines of the stem, the stern, keel, and gunwale; while the vertical straight lines drawn square, or at right angles to the L W L, represent the sections, which are shown also as straight lines in the half-breadth, and as curved in the body plan.

In the half-breadth plan half the intended boat is shown, overturned or bottom side up. The long straight line at the lower part of the plan represents the centre of the keel, while the curved lines are the water lines which represent the form of the boat along certain given points parallel to the L W L in the sheer plan, and show how the water will be divided at the bow, and closed again at the stern as the boat moves along. As before stated, these water lines are common to all the plans, and while curved in the half-breadth, they are straight and parallel to the L W L in the other two plans. It is upon the formation of these water lines that a boat depends for its sailing qualities. The boat *must* divide the water with nice easy curves forward, and allow it to close in again aft as she moves, or else, if too full or blunt forward, the boat will be difficult to drive at any great speed, and even then will push an ugly wave in front of her; and if too full aft the same difficulty in propulsion will be experienced, and an ugly wave will be dragged along in the wake or rear of the boat.

And in the body plan the intended boat is represented upright, looking "end on," as to one half looking from the bow, and as to the other half looking from the stern. Here the sections are shown as curved lines, and give the form of the boat vertically, while the water lines are shown as straight lines, as in the sheer plan, and are here used for the purpose of assisting in ascertaining the curves of the sections.

Naval architects would design their boat from these plans, and would afterwards, if need be, prepare a model from them, but for the amateur with a fairly correct eye the method about to be described will be found by far the most workable.

Following, then, the method here proposed, the first step will be to make a model of the boat intended to be built. This is made to represent half the boat, and of course it is easy to build the other half from it. The model must be made to scale, and the larger the scale used the less liability is there to inaccuracies, because the boat is an enlarged edition of the model, and errors in the model are magnified in the boat ever so many times, according to the scale used. It is therefore of no little importance to get the model right and fair in the first instance. For a boat of the size given in the plate, the scale of 1 in. will be found convenient and most suitable to work from.

First, then, procure a sufficient number of pieces of wood, according to the number of water lines considered necessary. In the design before us these water lines are ½ in. apart. They should not be further apart for a small boat, and for a beginner, perhaps ¼ in. apart would be found an advantage. To follow the method shown in Figs. 1, 2, and 3, take eight pieces of clean dry yellow pine, free from knots and shakes, 27 in. long for the length of the model, by 3 in. wide for the half-breadth, and planed accurately to ½ in. thick. Fasten these pieces together with thin glue, and leave them under weights to dry. A builder making his model might peg the pieces together, but gluing will be found more satisfactory. These eight pieces of wood fastened together form a block 27 in. by 3 in. by 4 in., out of which we are to make the model, and from the model to prepare our plans, and so obtain our moulds to build from. The seams ½ in. apart in the block represent the water lines the same distance apart, and corresponding with the water lines in the sheer plan.

Models are invariably made showing the starboard or right-hand side of the boat, as in the plate, and as we have to work and cut away the wood on this side, it is necessary to make our pencil marks on the back of the model.

When the glue is dry, plane up the back of the block, keeping the surface square to the top and bottom (and of course to the water lines). Then mark the back in pencil, showing the rabbets of the stem, *a b*, stern, *c d*, keel, *b d*, and gunwale, *a c*, and also the midship section *x x* (as in Fig. 4), or according to reader's fancy, and cut away the wood to these marks, taking care to keep all the surfaces (for the present) square to the back, and frequent use of the square should be made for this purpose. Next turning the block over so as to stand upright, mark in pencil and cut away the wood along the gunwale and stern (as in Fig. 5), keeping these surfaces square to the top and bottom in the first instance. Then plane the bilge round, and the rest of the model must be shaped out with gouge and spokeshave to suit the eye of the designer, strict watch during this process being kept over the seams between the eight pieces of wood forming the block, to see that they form nice easy curves, without any lumps or flat places anywhere, remembering (in the case of a steamer) to leave a small swelling half-way up the stern post for the screw shaft. If the glue used is mixed with a little dark colouring matter, the seams will be more visible.

Of course the reader will have his own idea to carry out in his design, according to the particular purpose for which he requires the boat, but in the case of a small launch of the dimensions given, the model should be kept tolerably flat in the middle, with the floor rising only slightly towards the bilge. Round off the bilge fairly well, especially if the reader intends being his own builder, so as to facilitate the bending and fitting of the ribs; but do not cut away the ends of the boat much, or they will be too hollow. For a launch, the stern must be tolerably fine to admit of the water passing freely to the propeller, but where the launch is small the bow should be fuller, to carry the weight of the machinery, and to this latter desirable end and the stability of the boat a flat floor amidships will greatly tend.

Next take a clean piece of yellow pine a little larger than the model every way; plane it down to such a thickness as will represent half the thickness of the keel—in our case ⅛ of an inch. Glue this thin piece (which we will call the back-board) on the back of the model, and with a pencil mark thereon the keel, stem, and stern post and rudder, and cut away the wood to these marks.

Sand-paper all smooth, mark the L W L on the back-board, and the model is finished so far as is required for building purposes; directions will be given later on for polishing and mounting.

Having got the model to his satisfaction, the reader must next proceed to take the lines from it. This is accomplished by treating the model to a bath of hot water until all the pieces are persuaded to separate, first taking the precaution to see that the midship section is clearly marked across the back of the model square to the L W L as *x x*, shown in Fig. 4, and that there are such other distinguishing marks on the back edge of the smaller pieces as will show their positions when in proper order.

Wash all the glue off the pieces, and when they are thoroughly dry we may proceed with the plans. Take a piece of drawing paper of sufficient size, and draw the straight line L W L, as in the sheer plan in Fig. 1, and mark it L W L at each end, and placing the back-board with its L W L exactly over the L W L on the paper, draw all round it with pencil or compass pen, and this will give the elevation or side view of the intended boat. Parallel to the L W L draw the requisite number of water lines according to the number of seams in the model, as A, B, C, etc.; and at right angles to these draw the sections 1, 2, 3, etc., as many as may be thought advisable, marking the midship section with an *x* instead of a number, to distinguish it from the others. Then take all the pieces of wood forming the model (except the back-board) firmly in the left hand in their proper order and position, and placing them on the paper with the L W L of the model exactly over the L W L on the paper, draw with pencil or compass pen along the lower side and the two ends, and this will give the rabbets of the keel, stem, and stern, and the sheer plan is completed as far as is requisite for building purposes.

The half-breadth plan must next be proceeded with, and for this purpose draw the straight line O P, Fig. 2, at a sufficient distance below the sheer plan as on the plate, and parallel to this draw the straight line Q R for half the breadth of the keel, and at right angles to these draw the same number of sections as are in the sheer plan.

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Indeed, it is the best to continue the sections of the sheer plan right across the half-breadth plan, as in plate, and mark them 1, 2, 3, etc., to agree with the sheer plan. Then take the loose pieces of wood forming the model, one at a time, beginning say with the upper or larger one, and place it on the paper with its straight edge along the line Q R, and with its midship section mark *x* exactly over the midship section *x* on the paper, and draw round the piece of wood on its curved side with pencil or compass pen; and the curved line so drawn will, when completed with the addition of the small loose piece of wood from the bow end of the model, give the water line which represents the upper edge of the gunwale of the boat. Then take all the other pieces of wood in turn and draw round them as on plate, distinguishing them with A, B, C, etc., as shown, and the plan is complete.

The body plan next requires our attention, and its preparation will be found very interesting, as it brings out the result of all our previous work. First draw the L W L, which, for simplicity, is generally drawn as a continuation of the L W L in the sheer plan. At right angles to this draw the vertical straight line S T, Fig. 3, to represent the vertical centre line of the boat, and to the right and left of this, and parallel to it, draw the two straight lines shown on plate to represent half the breadth of the stem on the right, and half the breadth of the stern post on the left, and then put in the water lines parallel to the L W L. Next take a pair of sharp pointed dividers or compasses, and with these the measurements of the curved water lines of the half-breadth plan are to be pricked on the body plan in order to ascertain and form the curves of the sections in the latter plan, proceeding in this way:—Take the midship section first, and place one point of the compasses at *x* in the half-breadth plan, and adjust the other point to where the water line A is intersected by the midship section on the same plan, and then removing the compasses to the body plan, place one point on the vertical centre line S T, where it is intersected by the A water line, and prick that water line with the other point. Then going back to the half-breadth plan, place one point of the compasses again at *x*, and adjust the other point to where the water line B is intersected by the midship section on the same plan, and then removing the compasses to the body plan as before, place one point on the vertical centre line S T, where it is intersected by the B water line, and prick that water line with the other point. Proceed in this way until the measurements of all the water lines at the midship section in the half-breadth plan are transferred to the body plan; and then with a pencil sketch in the midship section on the body plan, drawing from point to point, as pricked on the water lines. The depth and height of the midship section, and of the other sections, below and above the L W L as here represented, must be ascertained with the compasses by measuring the distance below and above the L W L on the sheer plan, and pricking the measurements on the body plan. The section as sketched should then be inked in.

In the same way proceed to transfer the measurements of the sections 6, 5, 4, 3, 2, and 1, from the half-breadth plan to the body plan, sketching and inking them in as before mentioned. These sections should be sketched in the right-hand half of the body plan, and show the sections of the bow or forward portion of the boat; and the sections 8, 9, 10, 11, 12, and 13 should be transferred to and sketched in the left-hand half of the body plan and show the sections of the stern or after-end of the boat. The midship section may be put in both the right and left hand sides of the body plan.

The plans are now completed, so far as necessary for present purposes, though there are other methods of checking the lines as by bow and buttock lines and diagonals, but there is no need to go into such matters here; suffice it to say that if the designer has made any mistakes in his model (*i.e.*, made any flat or hollow places, or left any lumps upon it), the construction of the body plan will speedily bring to light his error, and to correct such error the process of "fairing" must be resorted to, but for all practical purposes this fairing can well enough be done in the building yard later on.

We must now proceed to turn our past labours to account and enlarge our plans to "life size," and for this purpose we must have resort to the "mould loft," which in our case will be a room with a large table in it, or a room where the floor space can be utilised.

Procure a large piece of stout paper—say rough brown paper—about 4 ft. square, and on this we are to draw a number of the sections of the body plan to their full size, from which the moulds are made for building. It is not necessary to draw all the sections, but a sufficient number must be drawn to enable the builder to follow the design, and in the boat under consideration it is suggested that it will be sufficient and necessary to take, say, the midship section and two of each side of it in addition to No. 13, for the stern board which must always be used; or say we take No. 13, and every alternate section. This will give us seven to work from.

On this paper draw the vertical straight line S T, near one side (as in Fig. 6), and at right angles to this line draw the L W L, and the other water lines 6 in. apart and parallel to one another, and proceed to transfer the seven sections which have been selected from the body plan to the brown paper, and if all the measurements in the body plan are multiplied by twelve (assuming the 1 in. scale to have been adopted), the result will be a drawing of the sections full size on the brown paper. As seven sections only are being drawn on this paper, both the forward and after sections may be drawn on the one piece (as in Fig. 6), and if distinguished as in that figure there will be no confusion.

It will now be an easy matter to lay the brown paper drawing over the pieces of wood out of which the moulds for building are to be made, and with a sprigbit to stab or prick the sections through on to the wood, and by reversing the paper the other half of the sections is obtained.

It only remains to be said that when the moulds are made and placed in position on the keel in the building yard, the application of long thin strips of wood used as battens, and bent along the moulds at several points, will readily show to the builder how and where (if at all) the model is in error, and by this simple fairing process he will quickly alter his moulds where necessary.

In conclusion, it is suggested that by carefully gluing the model together again, blacking the portion above the water line, and mounting on a mahogany or other dark wood background, and French polishing the whole, a very presentable workshop ornament is obtained, and if another set of lines have been previously taken from the model, and are framed to hang on the wall alongside of it, the result will be at least a pleasant reminiscence of a first attempt in boat designing.

A GOOD RAT-TRAP.

BY FRED CARRE.

WHETHER the ancient rats who lived with Noah in the ark were as clever and as hard to circumvent as their present descendants, I do not know. I suppose scientists have some explanation—heredity, or a growing acquaintance with the deceitful ways of men—still, it is a fact, explain it as we may, the present race of rats is no more to be caught with chaff than the proverbial "old bird."

Chaff is no doubt a very useful auxiliary in rat-catching; but there are some positions in which it is not possible to use it in conjunction with the ordinary style of traps; *e.g.*, if the hole is in the floor, or at the bottom of a door, or in some place where the rats have not a run in which the trap can be laid and covered up with chaff.

The baiting of traps for old rats, at least, I have never found anything but vexation of spirit; for no matter how done, if touched at all by the old rat, he generally succeeds in taking it away night after night without catching himself. And if he cannot do this, he is quite wise enough to leave the most tempting morsels untouched.

The common gin-trap is, I believe, the one almost exclusively used by the professional rat-catcher; but except as set by the professional or hidden in chaff, in a run, it is vain to expect to catch a knowing old rat who has taken up his abode in a house, and who has become familiar with the owner's ways and means.

It is this single, bachelor rat who regards your house as his own, and who, not unjustly, I believe, is credited with warning off all poachers on his domain. It is this gentleman whom it is so hard to catch off his guard, or induce to put his foot into any ordinary trap. If you would get the better of him, something out of the usual run must be secured.

Now as such a trap was a short time ago shown to me, and as I have successfully made one for myself, it may interest some readers if I describe it and give a few hints as to how it can be made by any one with a moderate amount of mechanical skill.

The trap is specially designed for being placed over the hole through which the rat enters the room. If this hole be in the door the trap can be attached, and the door opened and shut without in any way interfering with it. If in the surbase, it is screwed to it, is quite free from danger and out of the way, and though it may not catch the rat, as long as it remains over the hole there is no possibility of his entering without being immediately impaled.

It can be so delicately adjusted that a *touch* will snap it, and by half a turn of the small regulating screw, made so heavy, that while still set, the rats may pass and repass till they lose all fear, when by turning the screw back it is made to go off on the first attempt to pass.

These seem to be all points in its favour.

It will be seen on looking at Fig. 1, which represents the trap as it is when set, that the framework consists of a brass or iron flanged ring of such a size as will just allow a rat to pass, and almost necessitate his filling the hole and rubbing the sides with

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his skin as he passes through. This hole may be from 1½ in. to 1¾ in. diameter.

This ring is not an absolute necessity, as a hole of the requisite size may be bored in the board, on which the spring and daggers are to be fastened, and a little bar of iron or brass screwed on to it to form the guide for the daggers and make a support for the trigger, and the rod on which the spiral spring works.

In some ways the wood has the advantage over the metal, as I have found that rats are not so timorous of wood as they are of metal. The object of the metal ring is to secure that the rats will not gnaw the hole so big as to allow themselves to pass without risk of touching the trigger; but really I think there is very little fear of this. If there is, it can easily be lined with tin, which will make all safe.

Moreover, there may be some little difficulty in getting a ring of the right form, unless you make a model and get it cast; or if you can, cast it in brass as I did myself. It is not a very difficult job, and I shall give one or two hints which will be helpful to anyone making the attempt to do all the work himself.

But let me resume my description. It will be seen that on the left-hand side of the ring there is a boss, through which are drilled three holes; the central one is diametrical, and the other two are parallel with it, and in them the two daggers slide. The daggers are attached to a movable piece B, into which they are riveted or screwed at their upper ends, and this piece slides on the central rod, which is screwed into the central hole of the ring at one end, and attached to the base-board at the other.

On this rod is a spiral spring of hard brass wire about eighteen to twenty gauge, which drives the daggers down, on the trigger being pressed by a rat attempting to pass through. It does not need that this spring be very strong. No rat, once it descends upon him, can ever escape, even though the dagger did not penetrate completely through his body. He can only pull backwards or forwards, and this does not affect the spring. The softer the spring can be made while still having sufficient power to hold its own, the better, because the trigger can then be made so much lighter in touch.

The trigger is the only thing remaining to be noticed, and it will be seen that it is made of two links, one straight and the other prolonged beyond its joint, and bent as shown to form the touch-piece. The bend must be sunk so as to cause it to come when set within about ½ in. or ⅜ in. of the bottom of the hole; and when in that position, the three pivots should be in line, but with the centre pivot just the smallest degree possible on the lower side of the straight line joining the two end pivots.

The amount of this deflection is regulated by the small screw S, which passes through a small projection of the sliding piece, and presses against the edge of the upper link.

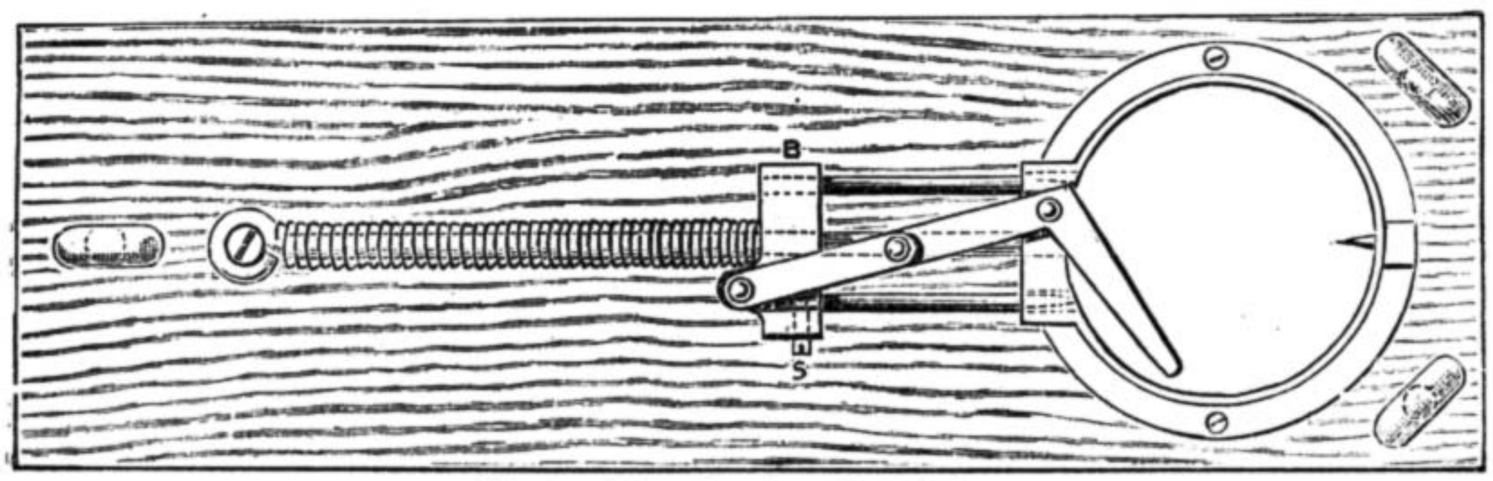

Fig. 1.—Plan showing Trap Set.

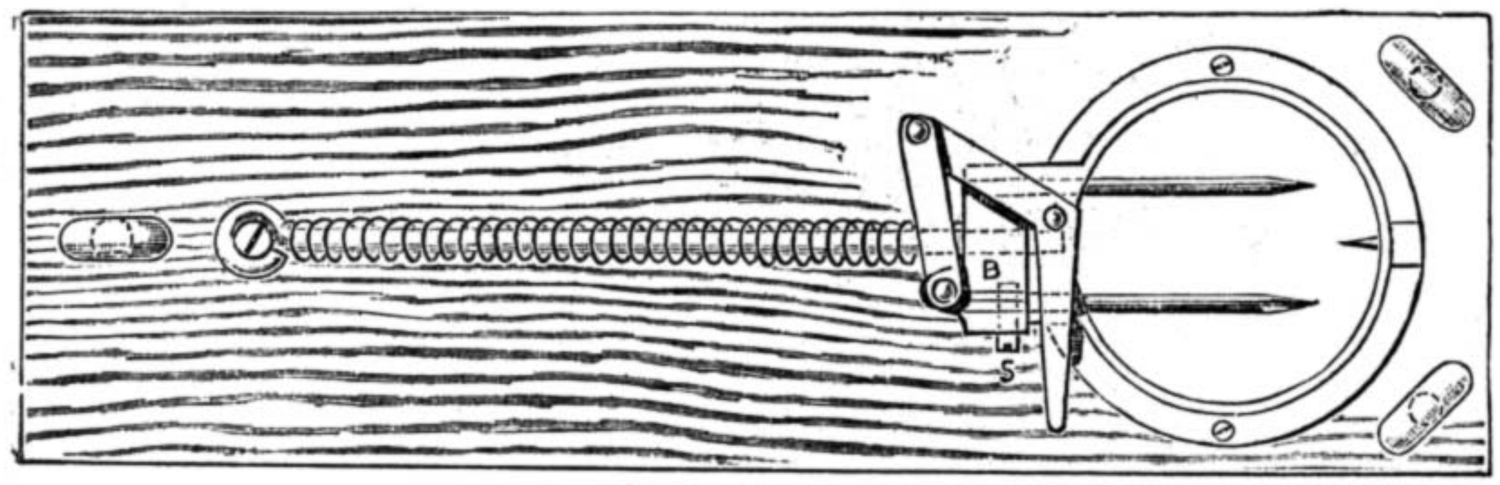

Fig. 2.—Plan showing Trap Sprung.

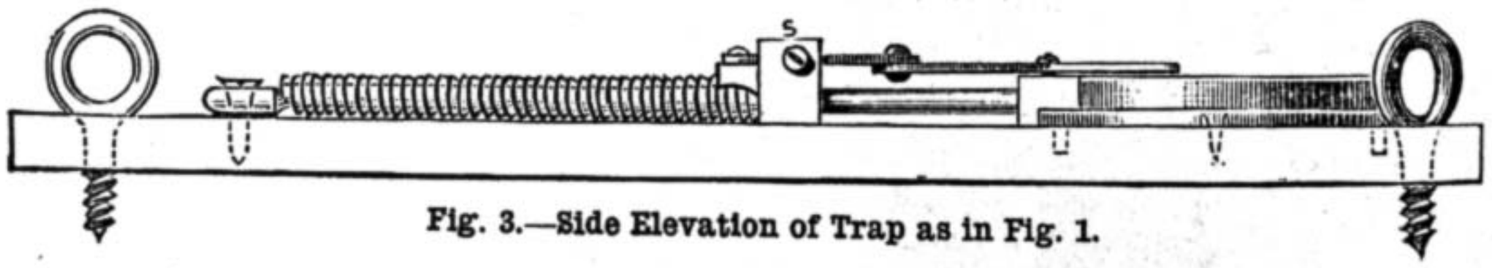

Fig. 3.—Side Elevation of Trap as in Fig. 1.

By this the touch can be regulated to the greatest nicety.

Fig. 2 shows the trap when snapped.

In the trap from which mine was copied there was a sharp spike passing through the ring as shown between the daggers; of course this gives greater security that the rat will not escape, but I think it wholly unnecessary, and I have omitted it in mine, as my object has been to make the hole as innocent-looking as possible. Rats are very sharp to notice anything that is suspicious-looking.

Now, one or two hints as to construction. If you make a pattern and have a casting made from it, you have merely to turn, in some hard wood, a ring to the size mentioned; this will be ⊣ shape in section.

On both sides of the ⊣ you will glue or sprig on two little pieces of wood to make the boss for the dagger-holes and the spring rod.

And as there may be some little difficulty in securing that the three holes in the sliding piece are parallel and coincide exactly with the three holes in the ring, let the sliding piece be cast all in one with the ring just in the position in which it is shown in Fig. 2. Bore the three holes through to the inside of the ring, and then cut off the sliding piece with a hack saw, and file to shape. You are then sure to have your holes to correspond.

One other point is to be noticed: in making the trigger links you must be most careful to have the end pivots equally distant from the centre one. The best way to secure this is to put in and rivet the central pivot first, then bore the other two holes together, *i.e.*, with the links folded on top of one another.

You may make these links out of sheet brass, 1/16 in. thick and 3/16 in. broad. Both arms of the bent link are the same in length, but if greater sensitiveness is required the touch part of the link may be longer.

A slight channel will be cut in the base-board to allow the spiral spring to have free play. This spring is made by simply rolling the hard brass wire on a straight rod or wire of the same or a slightly larger diameter than the rod on which it is to work. It is slipped on before the rod is screwed into the ring.

The trap is most easily attached to the door, or floor, by two or three screws with eye-heads, to be got at any hardware shop. These can be screwed in with the fingers, if a gimlet-hole be first made.

SHEET METAL WORK.

BY R. ALEXANDER.

DESCRIPTION OF MACHINES AND TOOLS (*continued*)—THE PANING DOWN MACHINE—THE CIRCLE CUTTER—BENCH TOOLS—STAKES—HAND TOOLS, ETC.—MATERIAL USED IN THE TRADE: TIN, ZINC, IRON, THEIR VARIOUS SIZES, THICKNESSES, AND PRICES—REPAIRS (*continued*)—HOW TO RE-BOTTOM ARTICLES.

Two machines in addition to those described in my last article are all I think it necessary to mention at present; when farther advanced with the subject it may be advisable to give drawings and particulars of other machines, of which there are many, but at present I think these will suffice. There are, in fact, few shops (except factories) that possess all the half-dozen or so described in this and the preceding article.

The paning down machine (Fig. 11) is a machine that closes the bottoms of articles after they have been taken up in the jenny, or otherwise the bottoms are tapped round with a light hammer and run round in this machine, once to close the edge, and then once more to bend the edge of the bottom up a little, ready for the bottom closing machine. Price, No. 1, £2 7s. 6d.; No. 2, £3.

Figs. 12 and 13 show the circle cutters in two forms. Fig. 12 is for tin work: it is very easy to understand and to use; it is fixed to the bench by a bolt and nut; the piece of tin to be cut has the circle described on it first by means of a pair of compasses; it is then placed on the machine, the screw A being placed on the centre mark, and the bow drawn along the frame of the machine till the two cutters are just on the line required to be cut; the screw B is then screwed down tight enough, the handle turned, and the circle cut. The reader will see that by this machine, where many bottoms, or covers, or anything circular in form have to be cut, absolute uniformity of size and truth of circle is secured. Fig. 13 is a similar machine, though differing in detail: it is for heavy work, such as sheet iron, thick copper, etc. The prices of these machines are, Fig. 12, to cut from 2½ in. to 14 in. diameter, £2 15s.;

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to cut from 3 in. to 18 in., £4 10s. Fig. 13, to cut circles from 5 in. to 36 in. diameter, £10. Larger sizes are made, but I need not particularise them here, as they are too large and expensive for any but manufacturers.

We will now deal with the stakes or large tools that fit in the holes or mortises in the for preparing the bottoms of articles that have to be "knocked up," or "closed" in a machine. Fig. 16 is the side stake, the tool on which most of the seaming of bodies of saucepans and such goods is done, also for knocking up bottoms upon. Fig. 17, the pipe stake, is a somewhat similar tool, but shorter in the stem and longer in the part that extinguisher stake, somewhat similar in shape to the bick iron, but much smaller. Fig. 21 is a saucepan belly stake for working on hollowed body saucepans. Fig. 22 is the tinman's "horse," though why it should have gained that name I am at a loss to imagine, as it in no way that I can see resembles that equine quadruped. The

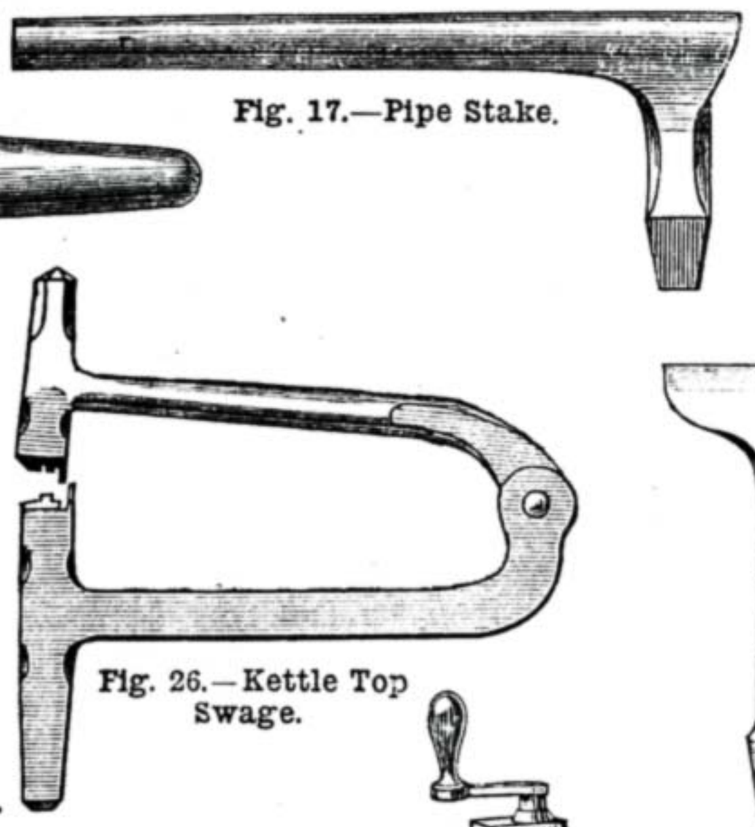

Fig. 17.—Pipe Stake.

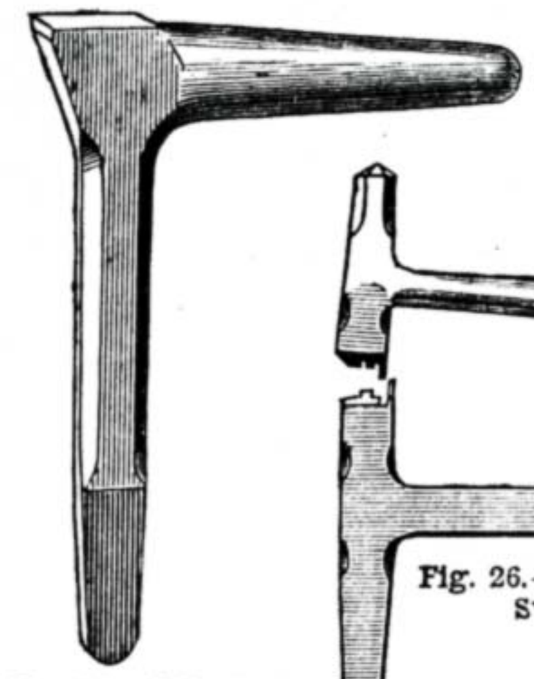

Fig. 16.—Side Stake.

Fig. 26.—Kettle Top Swage.

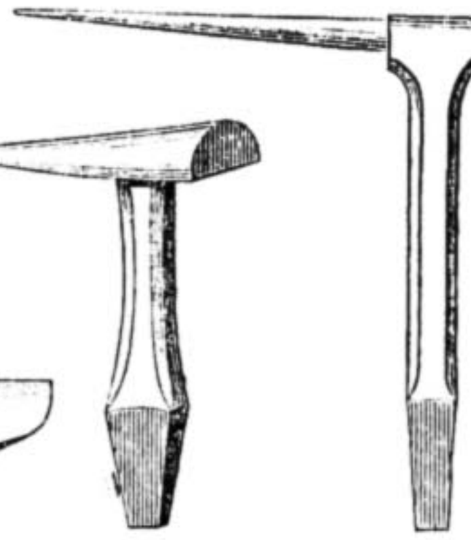

Fig. 18.—Funnel Stake.

Fig. 15.—Hatchet Stake.

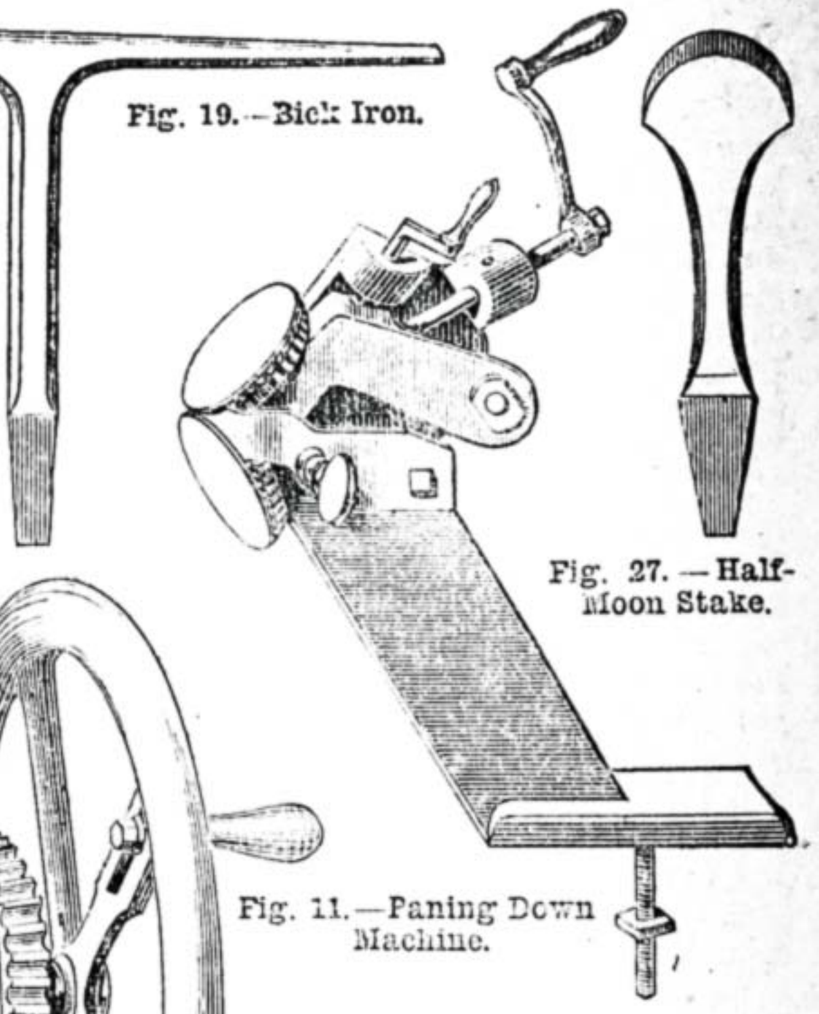

Fig. 19.—Bick Iron.

Fig. 27.—Half-Moon Stake.

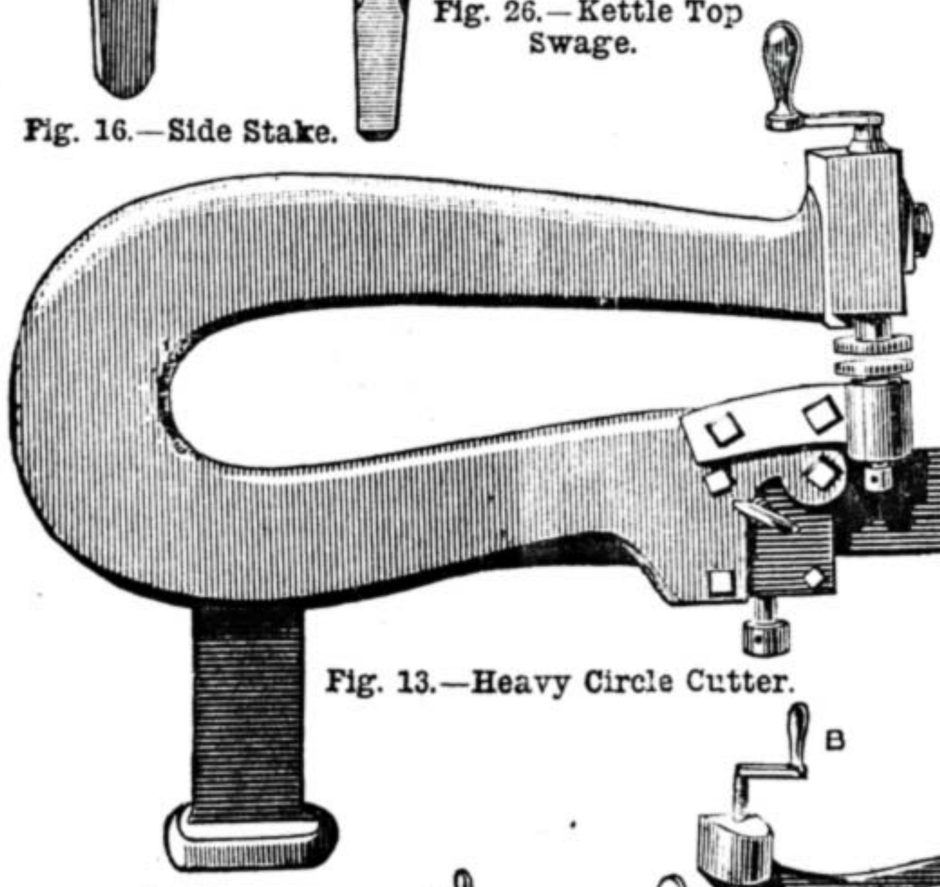

Fig. 13.—Heavy Circle Cutter.

Fig. 11.—Paning Down Machine.

Fig. 12.—Light Circle Cutter.

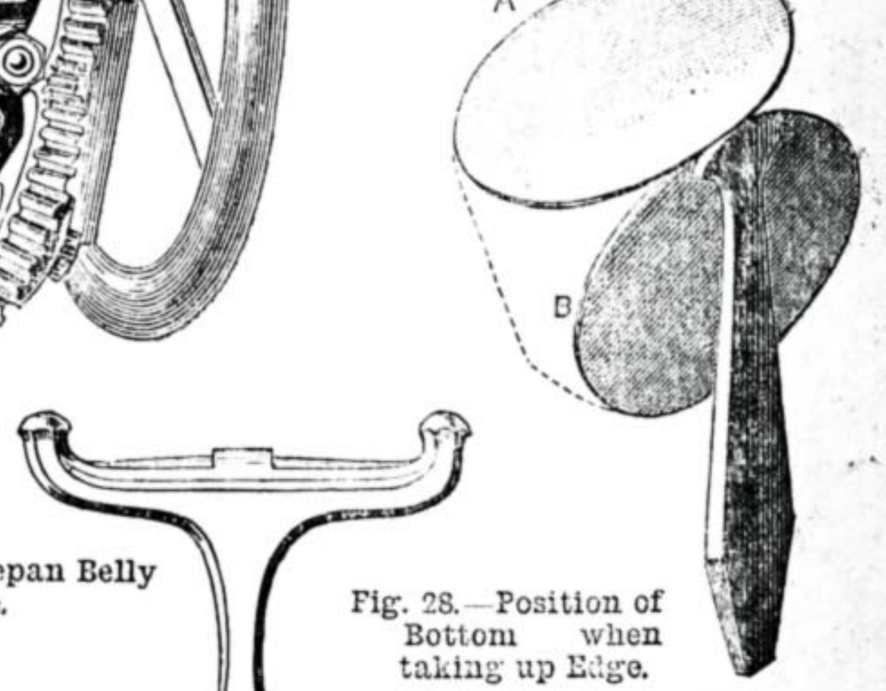

Fig. 28.—Position of Bottom when taking up Edge.

Fig. 21.—Saucepan Belly Stake.

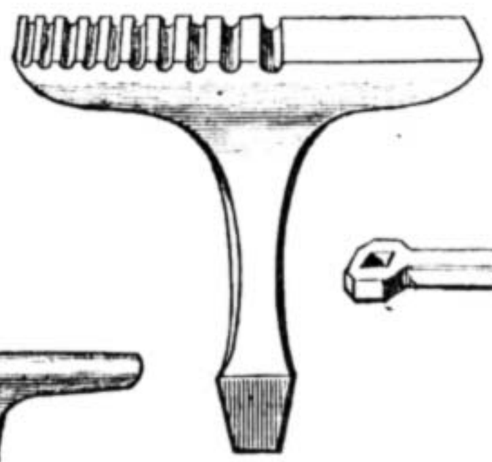

Fig. 14.—Creasing Stake.

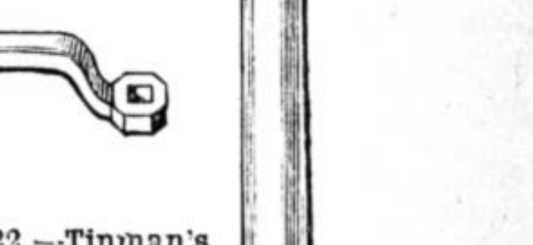

Fig. 29.—Paning Down Hammer.

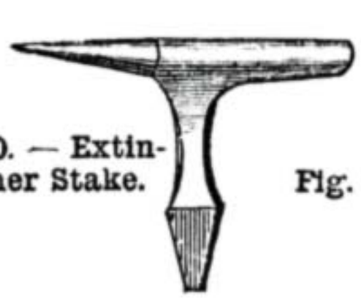

Fig. 20.—Extinguisher Stake.

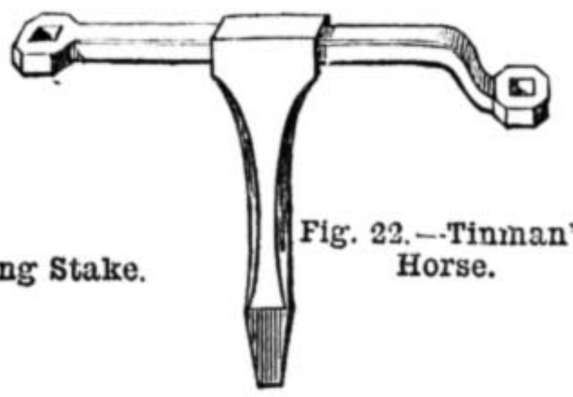

Fig. 22.—Tinman's Horse.

Figs. 23, 24, 25.—Horse Heads.

bench. Fig. 14 is the creasing stake, or crease iron, as it is usually called: it is used for many purposes; the grooved part is for sinking wire, creasing top of bottles, and when there is no jenny the plain part can be used for paning down on, for wiring on, and various other things. Fig. 15 shows the hatchet stake, called for shortness the hatchet: it is used for the edges of tinware, etc., where there is no folding machine, and for folding sheet iron and zinc work, and is worked upon, and without a square end, like the side stake, used for sheet iron stovepipe seaming, and knocking up of large articles can also be done on it. Fig. 18 shows the funnel stake, used for bending into shape such things as funnels, bottle taps oval and round, and for grooving or seaming them. Fig. 19 is a bick or beak iron; two or three of these are required in a tinman's outfit to turn the various sizes of saucepan handles, waterpot spouts, and such like. Fig. 20 is an holes at either end are for the horses' heads (of which he has several) to fit in. (See Figs. 23, 24, 25). Fig. 26 shows the kettle top swage, used for making the beading that forms the seat of the kettle cover; there are also the colander swage and the three-thread swage, which are the same in action, only differing in the shape of the dies.

I think at this part it will be as well to defer the consideration of the remaining tools till the next article, and to now give

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some information and advice respecting the various materials used in the repairing and making of the various articles that I hope to describe. We will first of all take tin, or, more properly speaking, tin plates. These are made in various sizes.

The following are those most in use: 14 in. × 10 in., known as singles, 15 in. × 11 in., middles or small doubles, 17 in. × 12½ in., doubles, 20 in. × 14 in., large doubles or twenties. The other sizes are generally called by their dimensions, such as 28 in. × 20 in., 30 in. × 22 in., 40 in. × 20 in., and various other sizes. The thickness of these plates is denoted by the number of crosses on the box: thus we speak of one cross single, two cross double, and so on; it is written thus: 1 × s, one cross single; 1 × × s, two cross single; the 1 is always prefixed, no matter how many crosses there are: thus, 1 × × × × D is 4 cross double, and is a 4 × plate 17 in. × 12½ in.; the word double has no relation whatever to thickness, it is merely a size. Some people have got a notion in their heads that an article to be good must be made of double block tin. Well, there is no such thing; there is block or ingot tin, which I have before mentioned, but that is of course not suitable for making teapots, etc., and there is double tin, which, as I have just explained, simply means the size plate used, and is not to be taken as meaning anything else, the strength or thickness being denoted by the No. of × ; there is also a thinner tin than 1 ×, known as 1c. There are also two qualities of tin, termed, from the process of annealing, charcoal and coke. Charcoal plates are the best, and I never use any other if I can help it, except for such work as packing-case lining or any work that there is no wiring or turning of edges, as coke plate will not stand it, though some makers advertise their coke plates as nearly equal to charcoal: a statement which I have never found verified by experience. These two kinds are again subdivided into what are termed perfect and wasters; the only difference between these is that the perfect, or prime, as some term them, are the selected sheets, and are supposed to be perfectly flat, evenly coated with tin, and free from flaws of any kind; the wasters are just as good in their working qualities as the perfect, but they have slight faults in them, such as a little spot badly tinned, a notch or two on the edge, a corner dog-eared, and other similar little faults: some that would never be noticed by an inexperienced person; for all ordinary work they will do as well as the perfect, which are only used for best work. There is another class of plates called "terne" plates: these are coated with a mixture of tin and lead, and are chiefly used for painted goods, and not always for that.

Larger sheets than the sizes I have mentioned are also made as follows: 6 ft. long by 2 ft., 2 ft. 6 in., and 3 ft. wide: this is called tinned sheet iron, and is very useful for large work.

Sheet Iron, Black and Galvanised.—This is made in the sizes given above, and the quality is denoted by the same words as the tin plates: viz., charcoal and coke; but the thickness is determined by the wire gauge; the sizes mostly in use in ordinary general shops are 26, 24, 22, 20, 18, and 16, and of these more of 24, 22, and 20 than of the others. There is used now, in place of charcoal, iron to a very great extent, a material called soft or mild steel: it is equal in its working qualities to charcoal iron, and has the advantage of being somewhat cheaper. A lot of tin plates are now made of this mild steel: in fact, I believe most of them are, though they still retain the name of charcoal tin. This is sold in sheets, ordinary size 3 ft. wide and 7 and 8 ft. long; its thickness is denoted by numbers, and they run the reverse way to those of sheet iron; thus No. 8 zinc would be very thin, about the thickness of 1c tin, while No. 8 iron is very thick; the sizes in general use are 9, 10, 11, and 12, and for very stout work, roofing, etc., No. 14. As to quality, the brand known as Vielle Montaigne Liège is considered the best, but I have seldom had to complain of zinc, of whatever make it may have been.

Prices.—These vary according to the market, so that the prices I give below must only be taken as approximate; the prices of the day may be obtained from all metal merchants and ironmongers.

Charcoal Tin Plates (per box).

			Perfect.	Waster.
	112 in box.	225 in box.		
1c	14 × 20	or 11 × 10	20s.	18s.
1 ×	„	„	25s.	23s.
1 × ×	„	„	30s.	28s.
1 × × ×	„	„	35s.	31s.
DC	17 × 12½	100 in box	18s.	16s.
D ×	„	„	22s.	19s.
D × ×	„	„	27s.	23s.
D × × ×	„	„	32s.	26s.

Coke plate about 3s. per box less; other sizes of tin plates in proportion.

Sheet Iron (Galvanised).

Common	per cwt.	11s. to 12s.
Best	„	17s. „ 18s.
Best Best	„	18s. „ 20s.
Charcoal	„	20s. „ 22s.
Soft Steel	„	18s. „ 20s.

Sheet Iron (Black).

Common	per cwt.	8s. 6d. to 9s. 6d.
Best	„	11s. 0d. „ 12s. 0d.
Best Best	„	12s. 6d. „ 13s. 6d.
Charcoal	„	14s. 6d. „ 15s. 6d.
Soft Steel	„	11s. 0d. „ 12s. 0d.

Tinned iron sheets about 10 per cent. dearer than galvanised. Zinc, 17s. to 18s. per cwt.

These are wholesale prices, only to be obtained by the trade; buyers through retail dealers will have to pay 20 to 30 per cent. more.

Presuming the reader of these articles to be ready to receive some instruction as to the use of these tools and materials, I will now proceed with the subject of repairs. We will first take the re-bottoming of articles, that being about 10 per cent. of the repairing in a general shop. There are several ways of doing this, and to illustrate them, let us suppose, for example, that we have a gallon saucepan, a coffee-pot, and a tin tea-pot. Taking the tin tea-pot first: if the bottom be examined, we shall find that the bottom has a narrow edge turned up and slipped on to the body, and soldered round. This method of putting the bottoms on is called capping, or slipping on; the old bottom must be got off either by holding it over the gas till the bottom is hot enough to melt the solder and allow you to knock it off, or by cutting it off with a thin chisel, holding the chisel as nearly parallel to the sides as possible. When the bottom is off, trim up the rough edges with the snips, and as you will probably have got it out of shape somewhat, true it up on the side stake with a mallet. The bottom can now be marked out by placing the pot on a piece of tin and marking round with a scoring awl, which is nothing more than an ordinary bradawl ground to a point.

Another way of marking out is to mark it before cutting off the bottom, by marking round it with a punch about ¼ in. or 1/16 in. in diameter. By this method the shape is not altered: this allows for the turn up; it is a very good way to mark toilet can, fish kettle, and other oval bottoms, as they alter in shape when the bottom is off, and it is not easy for a novice to get them true; if the bottoms are marked out in this way, it is advisable not to cut them out till you have offered the article on it and seen if it is too small or too large, which can then be regulated in the cutting. If a shade too large, cut inside the mark; if too small, cut outside: a very little will make the difference; it should show for the job we have in hand ⅛ in. clear cut all round, larger articles more, in proportion to their size. To turn the bottom up, place the half-moon stake (Fig. 27) in the bench, and commence to turn up the bottom; you will find it rather difficult at first to keep the bottom on the tool and to "take up" an equal amount all round. Do not try and turn it up all at once; go round it several times, turning it from you and holding it lightly in the hand; use a mallet, and do not strike too hard. The position of the bottom on the tool at start and finish is shown at Fig. 28, A and B. When you have been twice round, the bottom will be out of shape, or rather out of the flat; lay it on the crease iron or some flat tool, and rap round on the edge lightly with a small hammer: this will bring it right again. Then go round once more on the half-moon to finish it. The tea-pot body must now be scraped clean for about ¼ in. up the sides, and the bottom slipped on, taking care not to put it on askew; should it happen to be a little too tight to go on, lay it on a tool, and rap it round on the edge with a slight drawing motion of the hammer, take out any puckers that you may put in it by doing this, and you will then find it go on all right—that is, presuming that it was not a great deal too small. Should the bottom be too large, a little more edge may be taken up; the bottom is then soldered round. This method of putting on bottoms is suitable for tea-pots, canisters, hot-water cans, common bachelor's kettles, etc., and many workmen put toilet-can bottoms on in the same way, and though in some shops it would not be considered good workmanship, yet it is plenty good enough for a lot of them. With the coffee-pot we will illustrate the second method of putting on bottoms, called "paning down." In this case, the body has an edge thrown off the body, and the edge of the bottom is hammered down on to it and then soldered: this, as the reader will see, is a degree stronger than the preceding method, as if the bottom were to get hot enough to melt the solder the bottom could not drop off, although it might leak. To resume: knock the bottom off as previously described, scrape clean ½ in. up the sides, turn up the edges, and throw off a fresh edge for the new bottom; this can be done either on the hatchet or with the jenny. The way to edge in the jenny is as follows:—Turn the guide screw so that the guide bar comes about ⅛ in. back from the edge of the bottom wheel, or whatever the amount of edge you require: for large things more will be necessary; place the coffee-pot edge close to the guide, screw down the top wheel middling light, and pressing the coffee-pot slightly away from you, and holding it by the top with thumb and finger, turn the handle of the

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machine, raising the coffee-pot as it revolves till the edge is at a right angle with the sides. The bottom in this case being round, will be struck out with the compasses; ⅛ in. larger all round than the outside of the edge should be enough for small articles like this, but the beginner will most likely require a shade more, as novices generally are rather prone to take up too much edge on the bottoms at first. The edge may be turned up on the half-moon as first described in the case of the tea-pot or in the jenny. If in the jenny, reduce the size a little smaller than it was set for taking up the edge on the body; nip the bottom between the two wheels by means of the screw on top, rest the palm of the hand against the spring that projects from the machine, place the thumb on the top of the bottom and the fingers spread underneath it, press the bottom well away from you, and toward the machine, so as to keep it firmly against the guide bar: if not, it will run out; turn slowly at first, and gradually raise the bottom as you turn, and tighten up the top screw a little after you have been round once or twice. Keep it firm between the thumb and finger. You will be able to turn quicker after it has been round a time or two. When turned up sufficiently, remove and try on; if the bottom should prove too small, rap it back a little, and if too large, take up a little more edge on the half-moon, as it is not very practicable to take more up in the jenny. To be a good fit, it should just spring on with a click when the body is pressed into it. The next thing is to pane down the edge: this can be done on the crease iron, side stake, or any flat tool; hold the pot firmly in the left hand, and with the paning hammer (Fig. 29) close down the bottom: this requires a little practice before you get the knack of hitting the edge without injuring the side of the article on the one hand, or the tool you are working on on the other; though if you err at all, it is best to strike the tool a time or two than the article. After paning down, put up a bick iron, and turning the pot bottom upward, run round the bottom with a square face hammer—on the flat part of the tool, of course: this will smooth it off; all that then remains is to solder it round and try it. I find my space is gone, and shall, therefore, have to defer the third method till the next article.

THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

MODELLING FROM NATURE.

MODELLING FROM THE "LIFE"—LIFE SCHOOLS AND LIFE STUDIES—PORTRAIT MODELLING—MEDALLIONS — BUSTS — CABINET BUSTS — STATUES AND GROUPS—IDEAL SCULPTURE—SMALL SKETCHES IN DRIED CLAY—TERRA-COTTAS.

IN modelling from "the life," to use the technical expression, two things are apt to bother the beginner—the forms before him are constantly changing, more or less, and colour (which was absent in the cast) is apt to mislead him as to the real nature of form. It is, therefore, well that he should not come to this work till eye and hand have been somewhat practised. It is not usual to admit students to the "life" classes attached to schools of art till they have gained considerable technical skill. To enter these at the Royal Academy, it is the rule (or was in the writer's day) that the pupil should be able to finish a model from one of the antique statues in twenty-four hours, beside giving other proofs of proficiency. In such "life" schools, the work of the modeller consists chiefly in making reliefs and statuettes from the nude figure, and is very much a repetition of that in the antique schools, with the exception that the figure copied is now alive. Little needs to be said about them here. For our purpose it will be more desirable to speak of portrait and ideal work.

It should, however, be observed that modelling from a living person is far harder and more exhaustive work than mere copying from a cast. Living flesh and bone cannot retain the same pose for an unlimited period, like a lump of plaster; and the modeller, knowing this, has to put forth all his energies to make the best use of his time. With the strain put upon brain and eye and nerve, he tires before long. The sitter, too, grows weary, and falls into attitudes or assumes an expression which it is not desirable to copy. Hence it is generally allowed that, whether for the purposes of portrait or for mere study, the length of a sitting ought not to be for more than about two hours. Half a dozen such sittings will commonly suffice for a medallion portrait, and frequently for a bust. By this, it is not intended to be implied that such a portrait should be modelled in twelve hours—far from it, for much must be done between sittings, in completing what has then only been roughly sketched. Photographs may also be made use of in off-times; and after the sittings are over, much finishing will be required to fit the model for casting.

With the public, perhaps the most popular form of portrait sculpture is the medallion. It is also a favourite with modellers; for amateurs, and what one may call "small sculptors," it has peculiar advantages—it offers no technical difficulties, it can be modelled in an ordinary room, and it can be easily and safely cast.

It may be said that, as a rule, a medallion looks best on a flat circular ground, with the head in profile and somewhere about 4 in. high, and with a projection of perhaps some ¾ in. For such a head, with so much of the bust as it is necessary to show, a background of some 14 in. in diameter suffices. Medallions in which the head is more than 5 in. high, but less than life-size, are rarely satisfactory. Life-sized medallions in middle relief are better suited for large galleries and monumental purposes than for moderate rooms, in which they are apt to look clumsy; whilst in very low relief, and especially on concave grounds, they are best adapted for decorative purposes, and are far more difficult to manage than when in the style recommended.

Most modellers find that they can model a profile with greatest facility when it looks to the spectator's left, but it is not well to fall into the mannerism of working from one side of the face only. Practice should be made from both sides—a pair of medallions should look towards each other.

For reasons already discussed, a clay ground is to be preferred if the medallion is to be of the kind and size indicated. It is well to form a square slab on the modelling-board of greater breadth than the proposed diameter. The modeller will not then be obliged to waste care in bringing the head scrupulously to the centre. Striking a circle round the head, and leaving a proper space on every side, can be far more easily arranged in the process of casting; and will be mentioned when we come to speak of casting.

A small matter like the present is best modelled on an easel, which will permit of its being readily raised and lowered. The sitter should be placed for the light to fall somewhat from above and somewhat from behind him; this will best bring out the features. The model should be placed in much the same light, *i.e.*, with the back of the head towards the window; but as the work goes on, the easel will need turning occasionally to different lights, that errors may be corrected.

In works of this nature, which will be brought near to the eye and closely scrutinised in every part, perhaps the thing to be desired, next to a faithful likeness, is delicate and conscientious finish. In a female head, especially, all harsh and crude modelling is to be avoided; slightly lower relief than in the male subject is also desirable; and what has been said on softness of outline in low reliefs ought particularly to be borne in mind. The male head calls for more vigorous and decided work. The exact flow of the curved line in which a medallion portrait usually terminates a little below the neck is very much a matter of fancy, though some hold that by the management of its curves may be indicated whether the sitter is stout or thin.

In its completed state, a medallion shows best when hung in much the same light as that in which it was modelled, namely, with the back of the head turned in the direction of the window; and it should be hung as much on a level with the eye as possible. Comparatively few of the many medallions modelled are ever carried out in marble, for, unlike larger works in sculpture, they can readily be preserved in their original brilliancy, and made decorative in simple plaster. They should have gold frames, and the protection of convex glasses.

A more serious undertaking is the modelling of a life-sized portrait bust, and one for which such simple arrangements as the above will scarcely serve. As it will take somewhere about half a hundredweight of clay, it will hardly be the thing to do in a drawing-room. Most modellers are satisfied with a bust-frame such as that figured on a previous page, but some prefer one with only a short upright of iron or wood which does not reach to the neck, and to which they lash such a strength of gas-piping as will bear the weight of the head. The object of this is to allow of the head being turned and its position readjusted, if desired, up to a comparatively late stage of the work. The "pose," to use the technical term, of the head is always a matter of high importance in a bust. The way of carrying the head—whether erect, stooped, or inclined to either side—is often highly characteristic of the individual, and must be reproduced if the bust is to be a striking likeness. The flexible support gives special facilities for doing this.

The modeller ought, however, to be able to satisfy himself on this point during his first sitting, whilst his clay can still be moved freely on the wooden upright.

It is usual to build up a bust two or three days before the first sitting, but in a rough way, and so as rather to make it resemble a barber's block than anything human. When the sitting begins, care should be taken that the three heads—those of sitter, bust, and modeller — are upon the same level, and below that at which the light enters. The turn-table modelling-stool will be indispensable.

The pose is the first thing to be decided. For ordinary portraits it is not usual to

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make the face look directly to the front. By turning it to one side or the other, however slightly, a more life-like appearance is gained. Only in quite a stiff and formal bust should the head be kept rigidly to the central line. And attention must be paid to that characteristic carriage of the head, spoken of above. Chantrey, whose portrait busts have maintained the highest reputation in this country, is recorded to have had a way of settling this point before the first sitting by making a rule of inviting his sitter to breakfast, and of thus observing him when he was not aware that he was observed. Sir Francis showed wisdom in his generation. The knowledge that he is sitting for a portrait makes every one more or less constrained, and thus some part of the natural attitude and expression is lost. All who work at portraiture know this, and try, by drawing their sitters into interesting conversation, to make them forget their self-consciousness.

In the first sitting the general proportions ought to be well massed in, and however much the modeller may have trained his eye, it is prudent to take two or three of the main measurements with the callipers. He will thus have some certain standard by which to judge minor matters. It is not pleasant if, after several sittings and much labour, he finds that he has made some important error as to size—that he has too much width in the head from ear to ear, or too much length from back to face. Still, there are "dodges" by which such errors may be corrected without sacrificing any great amount of work. A clean cut may be made into the head with a wire, and a slice taken out, or in like manner clay may be put in to increase width, etc., so fertile is the art of modelling in resources!

In this, and indeed in all modelling from the life, a hand looking-glass will be found of great use. The model seen reflected in this is seen, so to speak, with a new eye, and faults are detected which had escaped notice when looked at in the ordinary way.

The power of rapid sketching will be found of especial value when roughing-in a portrait bust. It goes far towards securing a vigorous, as well as a faithful, likeness: worth consideration also is the greater satisfaction which it enables one to give to the sitter by getting some sort of resemblance early, for sitters are apt to take some disgust at the uncouth and often ridiculous appearance of a bust in its first stages.

The unaccustomed modeller is liable to find trouble in the hair. He may carefully sketch-in its arrangement at one sitting, and at the next find it altogether changed, and his labour lost. There is no certainty about it. The only sure thing with regard to it is that it will never be precisely the same at two consecutive sittings. His best plan is therefore to content himself in the first instance with merely indicating its general character with as few touches as possible, and leaving all detail to a sitting to be devoted to hair especially.

In most of the antique statues the difficulties connected with hair appear to have been avoided by treating it in a very conventional manner; but modern sculptors seek to be more naturalistic, and often with satisfactory results. Without the clay before one, with which to give a demonstration, it is not easy to explain how hair may be modelled. It has to be done with tools, and its texture is expressed by curved lines drawn with a tolerably sharp point, more flowing and continuous for smooth, and more abrupt and broken for curly, hair. Unless just at the parting line, or on those parts of a female head where it is brushed smooth, hair needs no softening down, but best shows its character by being left crisp from the tool. The little ragged fragments of clay which stick along the edges of the tool-marks aid the effect, and should be left untouched. Something even of colour may be indicated in modelling, if by bold touches the shadows are kept deep and strong in reproducing dark, and softer markings are used to bespeak light, hair.

If the locks are long, wavy, or massive, especially in the male sitter, they should be dealt with whilst the clay is still so plastic as to admit of free and bold handling. If smooth or closely cropped, the hair is better worked upon when the clay is in a harder state.

The best way of draping a bust is a point which admits of much discussion. The likeness is increased by giving the ordinary dress, but modern costume is generally allowed to be inartistic. It is, however, possible to take off much of its stiffness and ugliness by large and broad treatment, as, for example, has been done in Mr. Woolner's well-known bust of Lord Tennyson; and this compromise between taste and reason is now frequently resorted to. The Roman togas in which the sculptors of a century ago thought it necessary to make their sitters masquerade would scarcely be tolerated in the present day.

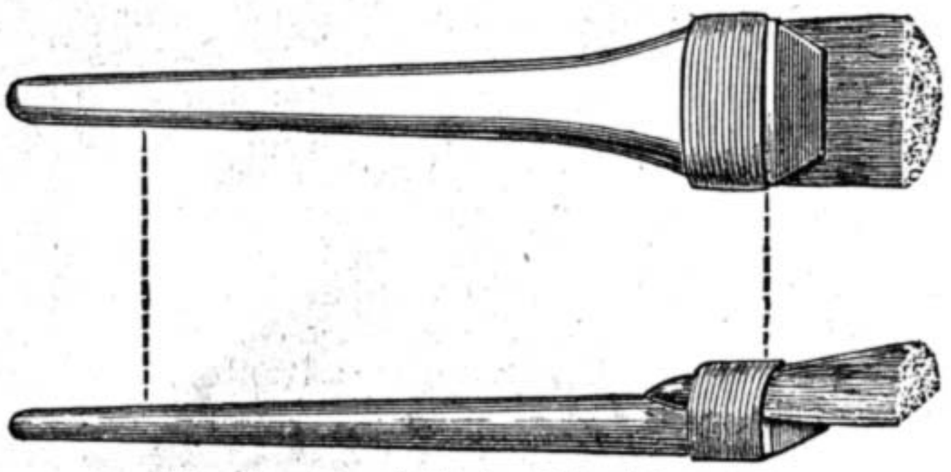

Fig. 17.—Brush for levelling Drapery.

Variety and artistic effect are also to be got without absurdity by making use of an academic or official robe, if the sitter is entitled to wear one, by a cloak, by a dressing-gown, etc. Sometimes we see the difficulty met by a mere piece of loose drapery thrown round the figure—which expedient admits of good artistic, if not of specially consistent, results. And sometimes an excellent effect is produced, particularly with a male subject, when the bust is of the stiff and formal terminal type, by leaving so much as is given of the chest wholly nude.

Sitting for a portrait is an occupation of which people soon grow weary. Few care to give more sittings than are absolutely necessary. The modeller therefore studies to do all that can then be done in the absence of his sitter. Should he resolve on some artistic treatment of the person's actual dress, he will find that he can do so as well with the help of a photograph as if the sitter were present. If he uses a piece of mere fancy drapery, all he needs is to throw a plaid round a plaster cast or a lay-figure, and to copy it at leisure. Drapery for such a purpose, however, needs to be arranged in good and effective folds, and must not be taken at random. A lay-figure, it may be observed, is a life-sized doll with movable joints, used by artists for the arrangement of drapery; and if academic or other loose robes are employed as drapery on a bust, they are best disposed for modelling from upon such a figure.

Drapery on a large scale, though laid in with the thumbs, needs to be shaped and worked up with flat toothed tools, and afterwards levelled (roughly) with a brush to be provided for that purpose. Such a brush is shown at half size in Fig. 17. This is a tool which the modeller can best make for himself. It is of stiff shoemaker's bristles securely lashed to a bit of wood for a handle. Being cut short and level, these bristles cut well into the clay, and bring the folds to level and uniformity; and an amount of finish can afterwards be given by dabbing with the sponge. But in most cases it is in parts only that the modeller cares to give a smooth surface to drapery. He thinks it more artistic if left in many places with the marks of tool and brush.

Good photographs are no small help in carrying out that work which has to be done between sittings, but without them there is much that may then be advanced. During sittings the modeller has to content himself with getting in what he sees roughly, and most of the smoothing and polishing he leaves till off-times. After the last sitting, also, a great deal of finishing will have to be done before the bust is fit for casting.

A word or two should be said about the small portrait busts known as "cabinet busts." In busts, as in medallions, the size should either be that of life, or else very considerably beneath it. A bust a little below life-size looks ridiculous. It suggests, not that the scale is a small one, but that the sitter had a preternaturally small head. In a cabinet bust the height of the head should never exceed four or five inches. Kept within these limits, however, this is a pretty and convenient style of portraiture; such a bust occupies little space, and is more easily accommodated with a good light than one of full size; and if not carried out in marble, the plaster cast can readily be protected from dust by a glass shade.

When the sculptor sets about a portrait statue, or an ideal group, or statue of life-size or larger, he first makes a small clay sketch of the proposed work. This small sketch he is able to play about—to try experiments with—to shape and bend and alter—till he has made every limb and every line compose to his mind. When he feels assured that it is in every respect satisfactory, he has a framework or skeleton of the required size and strength set up, and on this he proceeds to carry out the sketch in the actual proportions. On the large scale it is difficult to make alterations, and he therefore takes these preliminary precautions to avoid them, but they are not always to be avoided. Faults which in the small sketch were imperceptible may become offensive when they come to be magnified. This is said to be the cause why Flaxman's large statues are so inferior to his small figures. He did not make full-sized models. Being more at home in small work, he contented himself with modelling his statues to half-size only; and when all measurements came to be doubled in the marble, there was a doubling of all errors and shortcomings.

Whether his statue, or the figures in his group, as the case may be, are or are not to be draped eventually, the sculptor first models them nude, that the due proportions and proper action of each part may be correctly expressed; and to aid him in doing this he commonly has a living model before him to which to refer—the living models being men and women who hire

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themselves out for the purpose at so much per hour.

Small sketches in the round, in which the amount of clay is insignificant, will commonly bear their own weight without needing supports of any foreign substance, and may then be preserved without casting. Clay models in general fall to pieces in drying, chiefly because the wooden or metal supports embedded in them do not shrink with the clay, which consequently cracks. These small sketches may be dried, and, if carefully handled, kept for an unlimited length of time. Dusting them over with Venetian red before they are quite dry will give them something the look of terra cotta. All dried and unburnt clay is, however, exceedingly fragile.

Such, and indeed any, models composed of clay only can be converted by burning into actual terra-cottas. Some sculptors have kilns on their premises for this process, but this is not within the reach of every one, and there are places where one can get the "firing" done for a moderate charge. If the sculptor desires to have a plaster model reproduced in terra-cotta, he can get this also done by the terra-cotta makers.

Works for terra-cotta, however, demand somewhat special treatment. A sketchy style, bold and free handling, and crisp and decided modelling, seem better suited to it than delicacy. It is a material well fitted to convey force and vigour, and not, as is marble, to embody softness and high finish. Modelling for terra-cotta is hardly suited to a beginner in the art, and therefore it may be as well to abstain from making more than a mere passing allusion to it here, which will be sufficient for my purpose.

Carved Panel for Hanging Cabinet—The Poppy as a Motif.

CARVED PANELS FOR HANGING CABINET.

BY FRED MILLER.

The Poppy as a Motif.

It will be remembered that I gave in page 270 (No. 69) a representation of the chrysanthemum treated for carving, and promised another of the poppy, which I now give. In my notes on the treatment of the chrysanthemum I said that the remarks which I then made upon it would apply equally to that of the poppy, and that what I should say here would bear as much on the chrysanthemum as on that of the well known garden flower now under consideration.

The drawing of a plant from nature does this for one, that it makes one see for the first time what is in the plant that gives it its individuality. We may have looked at a poppy a hundred times, and we may think because we can always recognise a poppy that we know the plant. But let such an

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one who has only looked at the plant in a general way attempt to make a sketch from memory, and for the first time in his life his ignorance will be the chief thing he is conscious of, so little does he remember what the growth of the poppy is. I would go so far as to say we see nothing correctly until we have drawn it, and not then in many cases. In my own experience it has only been when I have made several studies of the same plant that I have grasped the peculiarities of its growth—its character. Once drawing it has impressed it generally upon my mind, but every time I have drawn it I have learnt something fresh about it. The designer wants to be constantly sketching from nature to sharpen his perception and to keep himself fresh.

In working from your studies don't think of details at all, let these come of their own accord. Place down the chief forms, such as the principal leaves, and in these panels you naturally start with the chief object, the flower. Work with freedom and with some free implement—charcoal or a brush and colour. Think of the panel as a whole all the time you are blocking out your work, for, by so doing, you will get the leaves to fall agreeably from the stem, making pleasing angles and occupying the space without crowding it. I have watched amateurs attempt to design, and they start by dwelling upon some one feature, or, beginning at the top, work downwards without regard to what else is coming. You cannot get proportion or balance in this way.

Don't be too neat in designing. Knock it about well. Brown paper and Chinese white and lamp-black are the best materials to use. Put in the forms boldly, for with white and black you can soon get an effect on brown paper. Put in and put out until you get the design to come well. These directions may sound truisms, but there is a good deal in the way one sets about one's work. I constantly find in myself a tendency to dwell too much on mere details, instead of going for the general effect and thinking of details afterwards: consequently, the freer the medium is you work in, and the bolder you work, the nearer will you come to success.

Those who want to refer to some good work on plant form, should consult such a book as G. C. Haité's work on plant form for designers, in which some fifty or sixty highly decorative plants are figured, with details of the various parts of the plants.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

41.—Reid's Lightning Brace.

To save time, space, and repetition, let me commence by saying that the tools and appliances noticed, and numbered from 41 to 45 inclusive, have been sent to me by Messrs. Richard Melhuish & Sons, 84, 85, and 87, Fetter Lane, London, E.C., and are supplied by them if they cannot be procured from or through any local dealer in tools. The appliance represented in Fig. 1 is Reid's Lightning Brace. It is of American origin, having been patented in the United States in 1882; but it has only been introduced into the tool market here in the present year, as far as I am aware. It is, as may be clearly seen from the illustration, an adaptation of the twist drill. The shaft which carries the tool at the lower end is fluted with spiral grooves throughout its length. It is fitted at the bottom, or lower end, into a steel cylinder, most of which is hidden within a loose piece of wood turned with two grooves, so that it may be held the more readily by the operator. The cylinder is recessed at its extremity with a square hole, into which is inserted the square shank of the tool used for screwdriving or boring, for there are two tools for these purposes supplied with the brace. The tool is held in place by a pin actuated by a spring that encircles the cylinder, and when pressed by the thumb and finger withdraws the pin, releasing the tool. The head of the shaft is secured within the long, steel, nickel-plated casing

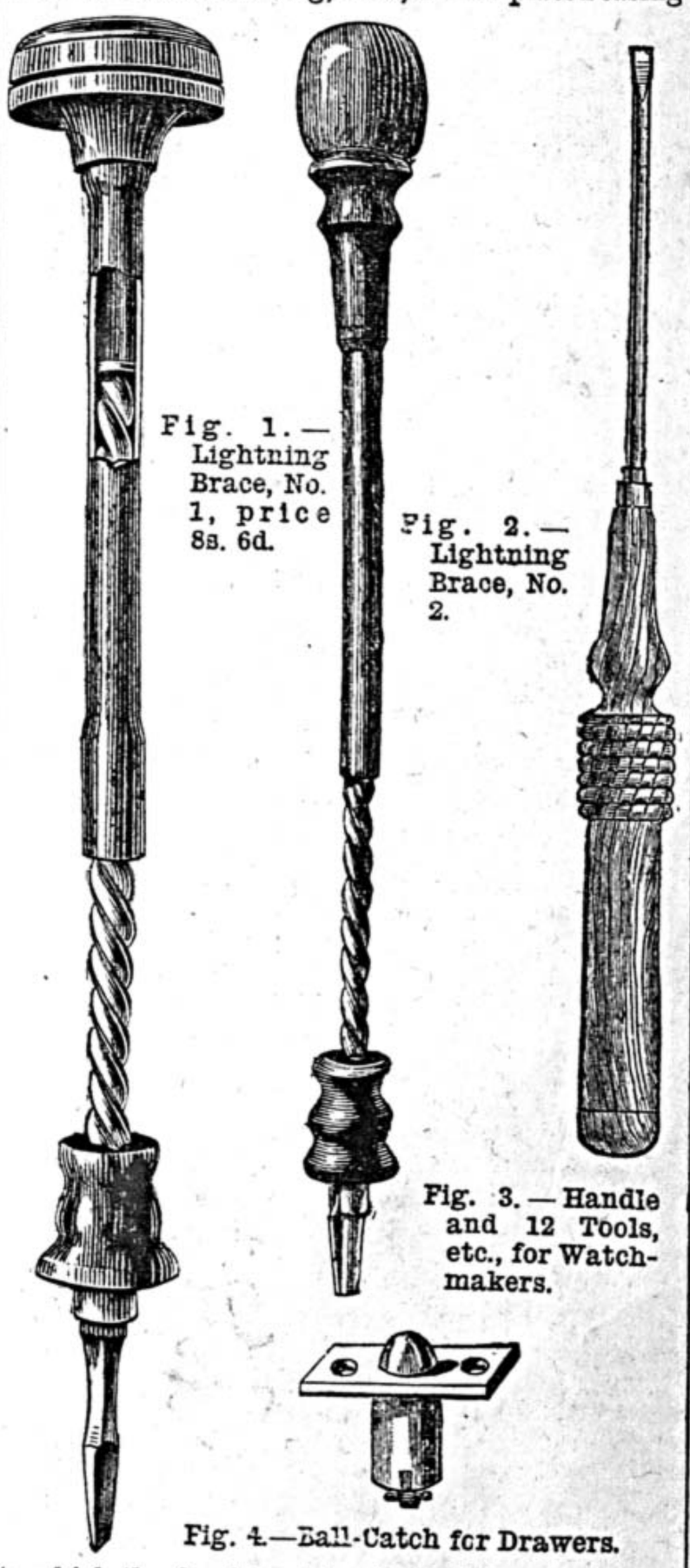

Fig. 1.—Lightning Brace, No. 1, price 8s. 6d.

Fig. 2.—Lightning Brace, No. 2.

Fig. 3.—Handle and 12 Tools, etc., for Watchmakers.

Fig. 4.—Ball-Catch for Drawers.

to which the fixed head is attached, having below it a loose head. The divided head acts as a fast and loose pulley; and by taking hold of the loose part, the case may be drawn to the top of the shaft without removing the tool from screw or hole, as the case may be, and the work of screwing or boring can then be continued by pressure on the fast head. The shaft is actuated by four projections at the end of the casing, which work in the flutings of the shaft. The price of the brace, as shown in Fig. 1, with two tools, is 8s. 6d. Another pattern is shown in Fig. 2, which is supplied with three tools. I do not know the price, but I believe it to be somewhat less than the larger one.

42.—Automatic Screwdriver.

The Automatic Screwdriver is a tool somewhat similar in principle to that which has just been described—that is to say, the blade of the screwdriver, which is cylindrical throughout its length except for about an inch at the top, where it is cut away on both sides so as to enter the notch in the top of any screw, works in a hollow handle partly of brass and partly of wood. In using it the blade must be drawn out to its full length, and inserted in the nick of the screw, which is then driven home by the rapid revolution of the blade, actuated by pressure on the top of the handle. It is a useful tool when rapidity in driving home a number of screws is a *sine quâ non*. When the blade is buried as far as may be in its handle, the tool may be used as any ordinary screwdriver—namely, by turning it either forwards or backwards, as the case may be. Its price is 5s. 6d. It is of American origin, being manufactured by the Decatur Coffin Company, Decatur, Illinois. It was patented in the United States in 1884.

43.—Handle and Twelve Tools, including Files, Broaches, and Saw.

This is a very handy collection of small tools, designed for the use of watchmakers, and equally well calculated to do good service to amateurs and others who require small, fine tools for delicate work. The handle is something like that which is shown in Fig. 3, but differs from that figured in the illustration by the wooden portion being enclosed for nearly half its length in a steel casing, and fitted at the upper end with a small thumbscrew to hold the tools in place. The tools include a remarkably fine saw, used by means of a brass handle, in which it is held throughout its entire length, both edges being available for sawing; eight files of various sections; and three broaches or reamers. The tools are enclosed in a wooden box. They appear to be of German manufacture. The price of handle and tools is 4s.

44.—Parallel Double-Action Screw-Vice.

The Parallel Double-Action Screw-Vice is one that can be recommended to all who require a handy iron bench-vice for small purposes. The body of the vice consists of what I may describe as an L-shaped bit of iron 4 in. in length, having a projecting piece parallel to the lower member of the L-piece, $1\frac{3}{8}$ in. long, whose lower surface is just $1\frac{5}{8}$ in. below the top of the piece. Fig. 5 will give a fair idea of its shape, and assist the reader to understand its action. At A it is pierced for a thumbscrew, capped with a revolving disc, nearly $\frac{5}{8}$ in. in diameter, armed with points projecting upwards. The surface B is also furnished with points knocked up from the metal. The distance between A and B is nearly 2 in., so that the vice may be readily fitted on to a bench of the thickness of $1\frac{1}{2}$ in. At C and D are two holes. Through C passes a shaft, screw-cut from the centre, or nearly so, in opposite directions, and actuated by a small bar passing through the outer end. Through D is a bar. The jaws of the vice travel along the bar through D, being moved backwards and forwards by the action of the double screw. Thus complete parallelism of the upright jaws of the vice is preserved. The jaws open to the extent of $\frac{7}{8}$ in. It is manufactured by Messrs. Peugeot Frères, of Paris, and is supplied at 5s. 6d.

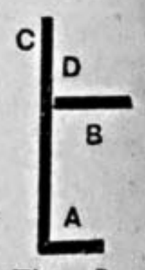

Fig. 5.—Shape of Body of Vice.

45.—Ball-Catch for Drawers.

This little appliance, shown in Fig. 4, will be found useful by those who do not care to put on a lock to a drawer, but yet wish to have a fastening of a less secure description which will act without a key. The lower part, or catch, is shown in Fig. 4, which gives the general form fairly enough, although in the sample before me there is nothing at the bottom as in the engraving, the lower part being a brass casing, shaped like a thimble. This and the plate are let into the upper edge of the drawer; and in the rail above a plate is let in, having a round hole in the centre, into which the ball-catch springs when the hole is directly over it. On pulling the drawer open, the catch is depressed by the plate and the drawer is opened. On pushing the drawer back to its place, the catch springs into the hole as the plate passes over it. The price ranges from 6d. to 1s. 6d., according to size.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letter from a Correspondent.

Cigarette Maker.—THOMASO writes in reply to C. W. B. (*Plymouth*) (see page 191, Vol. II.):—"It is pretty clear to me that you are trying to make an invisible hinge with an imperceptible joint, and that, too, whether the tube is open or shut. The only person able to help you in that would be the local conjurer. Get him to make two or three passes over it with his wand. Just look at Fig. 1 herewith. How does the "knuckle" of the hinge prevent it being soldered close to the tube; and why does it want "letting in?" I said use the small hinges sold for mounting fretwork because they are made of sheet metal, and can be readily bent to fit the curve of the tube. I also said make the tube about 6 in. long. Why do you suppose it is made so much longer than the cigarette if it is not to get over your very difficulty—the tobacco getting shut in the hinge? Open the tube wide and lay it on the table. Then lay tobacco in *one half of the tube*, as shown by the shaded portion of Fig. 2. Now if you

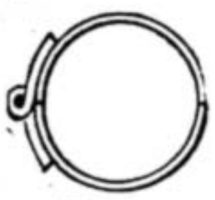

Fig. 1.

Fig. 2.

Cigarette Machine.

mean to tell me that you cannot pass your finger along the hinge and clear out straggling ends of tobacco, you must be a most remarkable young man—far more so than many who have been exhibited. If the tube was short the tobacco would have to be heaped up, as shown by the dotted line in Fig. 2, in order to get sufficient into the tube to make the cigarette, and would then be very likely to get in the hinge. But with the long tube the same amount of tobacco is spread over its whole length, and does not therefore need to be heaped up. When the tube is shut and the stick forced in, the tobacco gets pressed together and finally pushed out of the tube. What if a few shreds of tobacco are shut in the hinge! Can you not push the stick in with sufficient force to tear asunder two or three fragments of tobacco? The girls who make cigarettes with these tubes can. They often have to rest the end of the stick on the table and press the tube down on it with both hands; but that only happens when they have been careless in filling the tube. Making cigarettes is like most other things, it wants practice. I cannot make matters plainer if I write for a week. The answers given to questions in 'Shop' are necessarily brief, and a certain amount of common sense and perseverance in the querist is assumed. If you want to go deeper into the theory of cigarette making, you must continue the correspondence with someone who takes more interest in the subject than I do. *Au revoir!*"

II.—Questions Answered by Editor and Staff.

Paint for Coal Box.—A VERITABLE TYRO.—I assume that your handsome coal box, which you have covered with a blue enamel, has no carving or enriched work in relief. If this is the case I think you had better well rub it down with ordinary pumice-stone and very weak soda-water. This will be the only way to get rid of the rough brush markings, unless you clean all of it off down to the wood with a strong alkaline solution. As you think to paint upon it some artistic design or floral subject, a properly painted surface would be a very suitable ground. Having cut down the old surface to a good smooth face, as directed, you should make a little quick-drying white lead paint, and stain it to the colour you think most suitable (directions for which see "Plain and Decorative House Painting," Vol. I.). Two or three bare coats carefully spread will then make a solid surface; you can then paint your flowers; varnish afterwards with two or three coats of finest white copal, or maple will do. Varnishing last thing will protect your decorative painting. I hope this will enable you to make your coal box—Aspinall notwithstanding—"a thing of beauty," etc. If there are enriched portions to the article, the only way to clean them off is to "pickle" as above mentioned.—F. P.

Modelling and Casting Bust.—STUCCO.—You should first read the articles now printing in WORK on the "Mechanical Processes of Sculpture." A cast is made *hollow* by pouring a small quantity of liquid plaster into the mould, which is then turned about so that an equal thickness of the plaster may be deposited over every part.—M. M.

Rusty Boiler.—W. P. (*Blackburn*).—The way to prevent a washing boiler from going rusty is to dry it out carefully after using, and to keep it to the purpose for which it is intended, viz., washing clothes. But if your boiler has, as you state, a ¼ inch of rust on it, it is in a hopeless state, and I can only advise you to throw it away and procure a new one. Galvanised iron boilers, or, to speak properly, galvanised furnace pans, are used for cheapness, and are not to be compared to copper ones.—R. A.

Future Subjects.—YOUNG READER.—A paper on the subject to which you refer to suit you and all readers is in preparation.

Storage Battery Plates.—WHARMLY.—The lead plates you refer to are perforated with very small holes, and these are filled up with a paste made of red lead mixed with dilute sulphuric acid, applied with a wooden spatula until each plate is well coated with the paste. Instructions have been given in "Shop" in Vol. I. Further details will be given in my coming articles on "Model Electric Lights."—G. E. B.

Armature of Model Dynamo.—J. N. (*Glasgow*).—If you do not find what you require in my forthcoming articles on "Model Electric Lights" in the sections devoted to dynamos, write again and give a rough sketch of your machine, together with dimensions of the parts. I must have full details if correspondents wish me to help them.—G. E. B.

Cheap Battery for Electric Light.—W. S. G. (*London*).—Read my coming articles on "Model Electric Lights." You will learn in them how to fit up a battery for the electric light.—G. E. B.

Flux for Soldering.—A. T. E. (*Norwich*).—If you have read the articles on "Soldering" in No. 17, you would have seen that for wrought iron use killed spirits of salts; I know of nothing better. I cannot imagine what kind of flux you mean that has a sandy sediment; I prefer to keep mine as free from any foreign matter as possible. With regard to steel, it is not a suitable metal for soldering, partaking as it does of the nature of cast iron, but the ordinary killed spirits will answer as well as anything in this case also; I have very frequently soldered broken files and used them for a long time without breaking, using spirits as a flux. There are many nostrums sold as fluxes for soldering, but the one to beat spirits of salts for general work has yet to be discovered.—R. A.

Finishing Brazed Work.—F. B. (*Great Horton*).—Without knowing precisely the form and shape of the things that you want to finish up, I can only give you advice of a general character. You will have to get off all the superfluous metal and borax with a coarse file, then use a finer cut file, then a smooth ditto, and lastly go over with emery cloth, of different degrees of coarseness; the shape of the files depends on what you are finishing up; for a fit up for ordinary work I should get a 10 in. flat bastard file, ½ round ditto, 8 in. ½ round ditto, 10 in. flat smooth and 10 in. ½ round; the flat smooth are called hand files, and have what is called a "safe" edge, that is an edge that has no cut on it; this is useful to place against parts that do not require filing whilst you are filing adjacent parts. The emery cloth will sometimes require to be used like a file by wrapping it round a piece of stick to get at different parts of the article. After the articles have been got as smooth as possible, they are burnished—sometimes all over, sometimes only in places; this latter is then called relieving; it is done with steel tools highly polished and of various shapes, called burnishers; and sometimes they are "dead" finished by "dipping" in nitric acid, and after these processes the articles, to preserve the polish given to them, are lacquered. I would advise you not to attempt to make your own lacquer, you can buy it in small quantities cheaper and better than you could make it. You should be able to get it of any good colourman or Italian warehouseman, or you can get it from Messrs. Kirton & Co., Vincent Wharf, Dod Street, Limehouse, E. The method of applying it is, briefly, as follows: The goods to be lacquered are placed on a hot plate or in an oven to get the requisite degree of heat, which is about as hot as you can bear with the back of the hand; have a small tin pot to put the lacquer in, with a wire across it to drain the lacquer off the brush; use a camel-hair brush and take up only a small quantity at a time; apply it to the work in even strokes, going only once over any part of it at a time; if the lacquer gives off a hissing noise the things are too hot; and if the lacquer turns white on the things, they are not hot enough. The art of lacquering seems, and is, simple enough, but it requires a good deal of practice, and I may add a good deal of patience also. I trust these hints may be of some service to you.—R. A.

Lobster Back Cowl and Angles.—F. J. B. (*Slade*).—I send you herewith a diagram of a lobster back cowl section, Fig. 1.; it is often made in two pieces for convenience in hollowing and for economy in cutting out. If you want to strike it out geometrically you cannot do better than take the instructions given for setting out elbows, which you will find in the "Shop" column in No. 45 of WORK; these cowl sections being cut on exactly the same principle, though the angle formed by the joining of two cowl sections is a very obtuse one, still the rule applies. Thus you will have to proceed as follows: Describe your circle 10 in. in diameter, and produce through the centre the line A B, and draw also the two perpendicular lines C D and E F; draw both these lines exactly the same length, and then from the top of line E F draw a diagonal line to a point on line C D, just 1½ in. from the top. This gives the right bevel for section of cowl; the remainder of the directions apply just the same, and you will find this will give you a pattern of the curve for your cowl of 10 in. diameter; larger or smaller are done in the same way; I presume you understand the putting together. I shall be able to write more fully on cowls when I arrive at that portion of sheet metal work which treats of zinc work. For your half-round angles I must again refer you to the diagram just mentioned. If you look carefully at it for a moment or two you will see that if the curved line X X X will, when turned round, form a round pipe, bevelled at an angle of 90°, it would, if cut in halves, form a half-circular trough or half-round gutter of the same angle, but you would, of course, have to allow a little on each side for the wire or beading, say ½ in. There is a rule of thumb method of getting at patterns for angles both in pipes and half rounds that is sometimes adopted, and I have nothing to say against it as it answers the purpose very well, and that is to dip the piece of pipe or gutter into water, holding it at the exact angle required by means of a bevel or bent rule; the watermark round the pipe shows

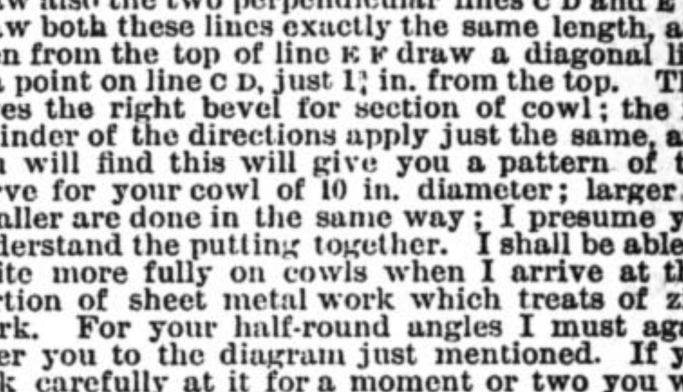

Fig. 2. Fig. 3.

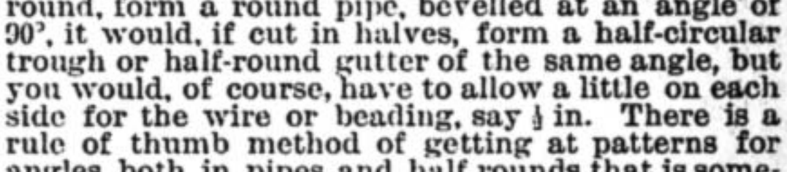

Fig. 1.

Fig. 1.—Lobster Back Cowl Section. Figs. 2, 3.—Ogee Gutter Angle (internal).

where to cut it. Respecting ogee angles, you ask for a simple method of striking out patterns for same. Of any angle I think you will find that you will seldom require any other angles than 90° and 120°, 90° for square work, and 120° for angles of bay-windows, and as ogees vary so much in shape, any method of striking them out to suit all appears to me impracticable. The simplest plan I can give you is to set your bevel to the angle required, place one arm against the back of a piece of ogee gutter, and let the other arm rest on the front edge; take a long scriber, and, holding it quite upright, mark the gutter across (inside of course), flatten it and cut to the line, and you have your pattern for as many as you require of that angle; of course you will remember in bending the pieces to the ogee shape that ogee angles are what is termed "handed," and you must bend them in pairs; thus Figs. 2 and 3 represent two pieces of zinc cut for an ogee internal angle. Supposing they were lying on the bench, just as you look at them on the paper, you would have in bending down the back, which is the part marked B, to take each piece just as it lay, and, placing it on the hatchet stake, bend B downward. I think this will render all clear to you; if in doubt on any point write again. Sheet metal work is continued in this number.—R. A.

Leakage through Slide Valve.—CH. G. D. (*Brixton*).—You find there is a large leakage when slide valve covers all three parts. I suppose you mean that the escape is seen at the exhaust, and that it occurs when the valve is in the middle of its stroke, at which time the piston would be at one end or other of its stroke. Supposing the valve and face are properly faced up, and do not leak at any other part of stroke of valve, it is hard to see how the steam can get under it when in the middle of its stroke, unless the edge of the slide valve were narrower than the width of the port (negative lap). Surely you would not arrange it so. Perhaps, then, the piston fits badly at one or both ends of the cylinder, so that steam can pass from the steam side to the exhaust side of the piston and so escape. In any failure of this sort, try to test one thing at a time—*e.g.*, test the piston, by taking off the cylinder cover while steam is up; then, while holding the wheel, let the steam drive the piston from the close end to the open end of the cylinder while you watch the amount of leakage; if piston is properly fitted there need be but the merest whiff of steam passing. Test the slide valve in a similar way by taking off both covers, and, while steam is up, and valve connected to eccentric, turn the engine round, watching the exhaust and the ends of the two ports in the cylinder; thus you can hardly fail to discover where the mischief is, and at what point the leak takes place; leave the valve so, turn off steam, open the valve box, and see where valve is.—F. A. M.

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Photographs on Tin.—R. P. (*Walkden*).—The plates used are termed "ferrotype plates," being very thin sheet iron covered with a dark coloured lacquer. The process is the ordinary wet collodion positive process same as on glass. The plates are not sold ready coated, but have to be prepared, just before use, by being coated with iodised collodion, then sensitised in a bath of silver nitrate, and developed with an iron developer as follows: Protosulphate of iron, 1½ ounce; nitrate of baryta, 1 ounce; alcohol, 1 ounce; nitric acid, 40 drops; water, 1 pint.—D.

Governor for Engine.—F. H. C. (*South Woodford*).—To the best of my belief, the form of compensating governor you describe has already been patented, or, if not so protected, is at any rate used in very similar form by one or two engine builders. I saw an engine six years ago which had a governor on precisely the same principle, which has also been applied to one form of marine engine governor. While regretting that your idea is not new, I must compliment you upon the very clear manner in which your sketches and explanations have been made. It would save much time and give far more satisfaction on both sides if all querists would imitate your example.—OLLA PODRIDA.

Boiler for Engine.—BOILER.—Double-block tin is not good enough for the purpose you require. Your boiler should be about 20 in. high by 10 in. in diameter, with a fire-box about 12 in. high by 8 in. diameter, and an internal flue or uptake about 1¾ in. or 2 in. diameter (a piece of pipe will do for this part). The gauge of sheet for shell should not be less than 14, and that for fire-box not less than 12 imperial wire gauge. You may use copper, but galvanised sheet steel will answer well. All the joints should be riveted close and well sweated with solder to ensure their being steam tight. You will want a safety valve test cock, steam gauge, and feed pump. The safety valve should not be loaded beyond 30 lbs. per square inch, and the boiler should not be used in the same room as the machine. The quantity of water it would take is of no moment, being small. I quote a *vertical* boiler as the most suitable, but in concluding must warn you that such work is very unsafe and dangerous unless done by a practical boiler maker.—OLLA PODRIDA.

Fire Screen.—SKIBOO.—Do you mean a four-fold screen, or the small cheval screen used to screen the fire, or a decorative ornament to hide the grate in summer? The three differ so entirely that I cannot help you without knowing which it may be. If the paper you mention is floral in design, the forms cut out and pasted on a black background, or on a dead gold paper, yield the best result; if, however, the designs are unsuitable for cutting out, treat the screen as a wall surface, with skirting, dado, chair band, filling, and frieze, and the effect will probably be satisfactory.—E. B. S.

Four-Folding Screen.—NOVICE.—Very soon a complete series of papers on folding screens will appear in our columns. Pending those, I may say, briefly, that the screen is usually made of light wooden framework, covered with canvas, such as paper-hangers use; the hinges are either of webbing, like those on a clothes-horse, or the metal double butts sold on purpose; if four-fold, a good size is 6 ft. high by 2 ft. for each fold, but it is entirely a matter of taste and convenience. The after-covering is so various that I cannot suggest it here. Gold Japanese leather paper is perhaps the best for an all-over surface.—E. B. S.

Medical Coil.—A. M. (*Edgware Road*).—From the fact of there being a box with tinfoil under your coil, I infer that yours is a spark coil, not a medical coil. There should be two wires coming out of the box: one at each end. Connect one of these to the pillar of the brake and the other to the spring. I cannot understand the rest of your letter, as you do not say what size of wire you are using, nor on what part you wound the six ounces. See my replies to J. M. (*Nottingham*), ELECTRIC LUBRICATOR (*Manchester*), W. B. C., and others in back numbers. A series of articles on coils will be forthcoming when room can be found for them.—G. E. B.

Sealing Battery Cells.—M. N. (*Plymouth*).—Melt two pounds of pitch in an iron ladle, and add to it 1 lb. of beeswax and 1 oz. of tallow. This mixture will serve the purpose; or you may use pitch alone, or sealing wax, or cobbler's wax if it suits your means. Anything of this kind will do. The zinc cells may be of any size or shape. The usual size have nearly a quart capacity. The zinc should be at least ⅛ in. in thickness.—G. E. B.

Manager of Electric Light Installation.—W. J. (*Swansea*).—To qualify for the post of manager of an electric light installation of any magnitude, you should enter a school of electrical engineering, or become the pupil of an electrical engineer. I suppose, at the outset, that you have had a fair elementary education, and have studied theoretical magnetism and electricity, for, without a thorough knowledge of these subjects, you would make but little progress. To theoretical knowledge must be added real practical knowledge, only obtainable in the work itself. It is quite possible there may be several men in charge of electric light installations who have learned to look after the lights and machines from seeing others do it, but these men cannot be said to be competent to manage any other, since they do not know anything of the principles of electric lighting.—G. E. B.

Electric Depilatory.—F. A. (*London, S.W.*).—As you wish to remove hairs, the apparatus you require is an electric depilatory; not a cauteriser. You will require a set of insulated needles, cost 6s. a pair, and some three or four cells of a chromic acid battery. The needles are inserted in the skin at the root of the offending hair, and then heated by the current to destroy the root. Apply to T. Gent & Co., Braunstone Gate, Leicester, for the necessary apparatus and instructions.—G. E. B.

Hot-Water Towel Airer.—ONE IN DOUBT.—I think with the aid of these sketches you will be able to fit up your towel airer successfully. No expansion pipe will be required, but an air cock (D in illustrations) should be fixed in the highest point of the coil to allow the air to escape while filling. Fig. 1 shows method of connecting where

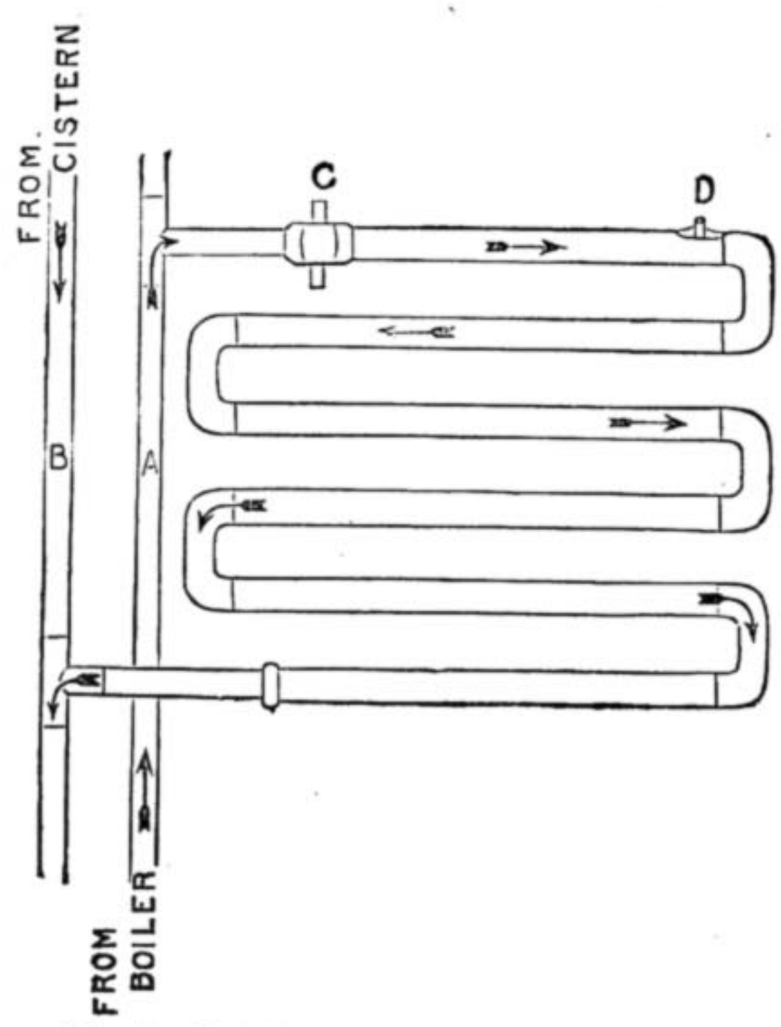

Fig. 1.—Hot-Water Vertical Connection.

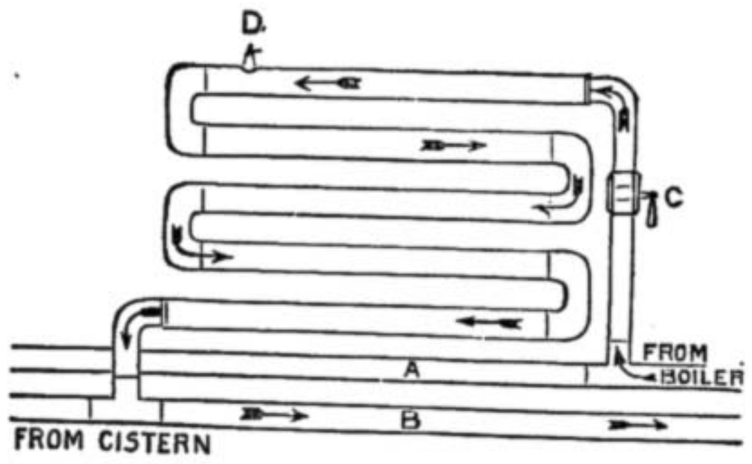

Fig. 2.—Hot-Water Horizontal Connection.

the supply pipes are vertical, and Fig. 2, when they are horizontal. A is the flow pipe, *i.e.*, the pipe from the top of boiler, and B the return pipe; C is a cock to stop the circulation when the coil is not required. Ordinary wrought iron hot-water pipe is shown in sketch, but cast iron coils would be fixed in the same manner.—T. W.

Alarum Bell.—BOMBARDIER.—If you will get for one penny No. 66 of WORK, and turn to p. 226, you will there see an illustration showing exactly how to connect up the wires to a continuous ringing bell. If used for a burglar alarm, a separate battery should be employed to foil Bill Sykes should he cut the main battery line wires. There will be waste in either case if the bell is not attended to in time.—G. E. B.

Smallest Incandescent Lamps.—W. W. (*Newcastle-on-Tyne*).—The smallest incandescent lamps are those of the "Fairy" or "Gem" pattern, as used for illuminated scarf pins. They are also called "Pea" lamps, because they are about the size of large peas. They cost from 5s. to 7s. 6d., and may be obtained from or through any dealer in electrical instruments.—G. E. B.

Galvanometer.—G. E. S. (*Berkeley*).—A description of this instrument, to be of any use, should be illustrated, and we have not room for this in "Shop." The subject will be dealt with in a short article at the earliest possible opportunity. The machine you mention will be described in the series of articles on "Coils," now in course of preparation. G. E. B.

Cabinet Sketches in Perspective.—PERSPECTIVE.—Most decidedly, miniature sketches of cabinet work should always be drawn according to the rules of perspective. You say, "or is it best to train the eye to the different perspective views, as I find the rules of it very confusing?" No doubt you do, but after a few years practice you will find they are not so complicated as they appear. It is very much a matter for regret when a person wants to learn any particular trade or art without first properly acquiring the rudiments of it, and I am sorry to learn from your letter that you must be included in this class. Begin at the beginning and you will "train the eye." I—as all others have to do—had to undergo a regular course of training by an experienced master (learning the rules first), and now I draw by "hand and eye." Get as many book catalogues as you can afford postage to send for, and you will find plenty among the contents suitable for you. Don't fail to get Messrs. Cassell & Co.'s and Messrs. Blackie & Son's (Old Bailey) catalogues. In the former you will find one named "Drawing for Cabinet Makers," 3s. Do not forget that if you intend to learn any branch of the art of drawing, and start on the "hand and eye" principle, when a few years have elapsed you will regret not having learnt the rules properly; one reason being the inferiority of your work, and another being ignorance of the rudiments whilst practising finished drawings.—J. S.

Engraving on Metal.—BRASS.—In answer to your letter I have to state that in nearly all engravers' shops work will be done in a different style. Your remarks I reply to *in seriatim*:—(1) Tools of whatever description may be purchased at all sorts of prices. (2) Chisels, if untradesman-like, are most useful tools in the hands of a skilful workman. (3) This paragraph is rather dense, but we always used the chisels wherever we could with advantage. (4) The drawing on of letters may certainly be done with pen and ink, but I am stupid enough to prefer my own way. (5) The artistic plate engraved in three different styles may not be appropriate for outside use, but it is there, and has been for the last fifteen years, and, although much worn, can still be discerned; and as I had nothing whatever to do with the design of the plate, the matter ends. (6) The thickness of the plate depends upon the quotation for the work; in my old shop the gauge of the plate was decided upon by the customer, who was informed of the cost, but nowadays I daresay that the plates are so thin that BRASS often cuts through them. (7) The cement does not find favour with our practical friend, and he has not met with its use in "all his travels." Perhaps he may find occasion to travel a little farther. (8) The "setting off" gravers and chisels is a matter of personal use; I could not work with another man's tools, and *vice-versâ*. (9) Undercutting was always insisted upon where I learnt my trade, and the tool is the same as for outlining, used in a different way. (10) I need say nothing of this, the removal of the "burr" being quite a matter of shop practice. (11) The above remarks apply here. In conclusion, BRASS should be a little more courteous, as civility, even in letter writing, costs nothing.—N. M.

Subjects in WORK.—INQUIRER.—You and other correspondents who are anxious to know if particular articles have appeared in Vol. I. of WORK, cannot do better than buy an Index to that volume—which Index can be had of every bookseller for one penny. All information possible will then be before you.

Cheffonier.—INFLEXIBLE.—I regret to say that your cheffonier paper is not suitable for WORK. You give your name, but not your address. Kindly forward the latter to the Editor and your manuscript shall be returned to you.

Tempering Pivot Drills.—W. K. (*Bolton*).—Heat to cherry red and plunge into a tallow candle or into soap, hardening and tempering being thus done at one operation.—J.

Book on Metal Work.—SUCCESS.—"Metal Work and its Artistic Design," by M. Digby Wyatt, was published in 1852, by Day & Son, Lincoln's Inn Fields, at the price of six or seven guineas, I forget which. You may get a copy second-hand for about £2. Try Batsford, High Holborn, Sotheran in the Strand, or Bumpus or Quaritch in Piccadilly. The book is a splendid folio with fifty plates of old metal work in iron, bronze, and gold, with eighty-one pages of letterpress.—J.

Gesso Work.—A. B. C. (*Houndsditch*).—The composition for gesso work is sold by the Society of Artists, 53, New Bond Street, W. The price is 1s. 6d. for two tins; one containing the liquid and the other the powder. These are mixed when required for use; full directions are given on the tins.—E. C.

Cheap Cameras.—T. E. B. (*Landport*).—You must not trust too much to the promise of advertisements. It is true that a proper photograph can be taken without either camera or lens, a light tight box and a pin hole being sufficient, but the practical utility of it is quite another matter. Any apparatus to cost less shillings than an ordinary well-made set will cost pounds, is its own answer—a mere toy. Ten shillings would purchase the remaining necessaries for producing a photograph, or even half a crown, by going the cheapest way to work.—E. D.

Wire-wove Roofing.—PATIENCE.—I have seen wire-wove roofing used for many purposes, but could hardly say what effect it would have on plants if used for a greenhouse roof. Personally, I should not care to venture the experiment. The light transmitted is not so pure as that through glass, and might have the effect, as you fear, of making the plants sickly. I can see no advantage in using the wire-wove for such a purpose, except its non

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liability to breakage, and if your greenhouse is far enough away from the genus boy, who delights in throwing stones, I should advise you to stick to glass.—G. LE B.

Transfers for Slides.—A. E. B. (*Cromer*) asks:—"Where can I obtain transfers to stick on glass, suitable for magic lantern slides?"—I should say in a general way, these may be obtained at any place where they make the lanterns a speciality. A. E. B. may, I know, obtain what he needs of Lancaster and Sons, opticians, Colemore Row, Birmingham. I have no personal interest in recommending Mr. Lancaster, but I know A. E. B. can get what he requires of him—transfer varnish and full directions. He would do well to write for his catalogue, price 6d., it contains much useful information. An article on the subject of lantern slides will shortly be in the hands of the Editor.—O. B.

Barometer.—W. B. (*Leith*).—W. B. says:—"I have a barometer, the tube of which has become very dirty, kindly let me know how to clean it." W. B. does not say if it is the inside or the outside of the tube which needs cleaning; I presume it is the former. I also presume the dirt referred to is some impurity in the mercury which has stuck to the tube. It would have been much easier to answer the question if a little more information had been given. If it is what I suppose, W. B. must empty the tube and fill it with nitric acid, which will dissolve the impurities, after which it must be well rinsed out with water to remove the acid, dried, and refilled with mercury, which for this purpose should always be distilled, as mere filtering does not render it free from all impurities. —O. B.

WORK Volumes.—W. E. R. (*Southgate*).—These are now sold bound in cloth, with index, price 7s. 6d.

Wringing Machine.—(*Ditton*).—If you take my advice you will not attempt to make the above yourself, for even if you buy the rollers there are still a great many little things wanted; and by the time you bought all the things you could not make, and the hard wood to make the frame, etc., you would have spent as much money as you could get one for complete. If you write to Harper Twelvetrees, of 8. City Road, London, E.C., they will send you an illustrated catalogue, and I think you will find that they supply them complete for as low as 20s. each.—E. D.

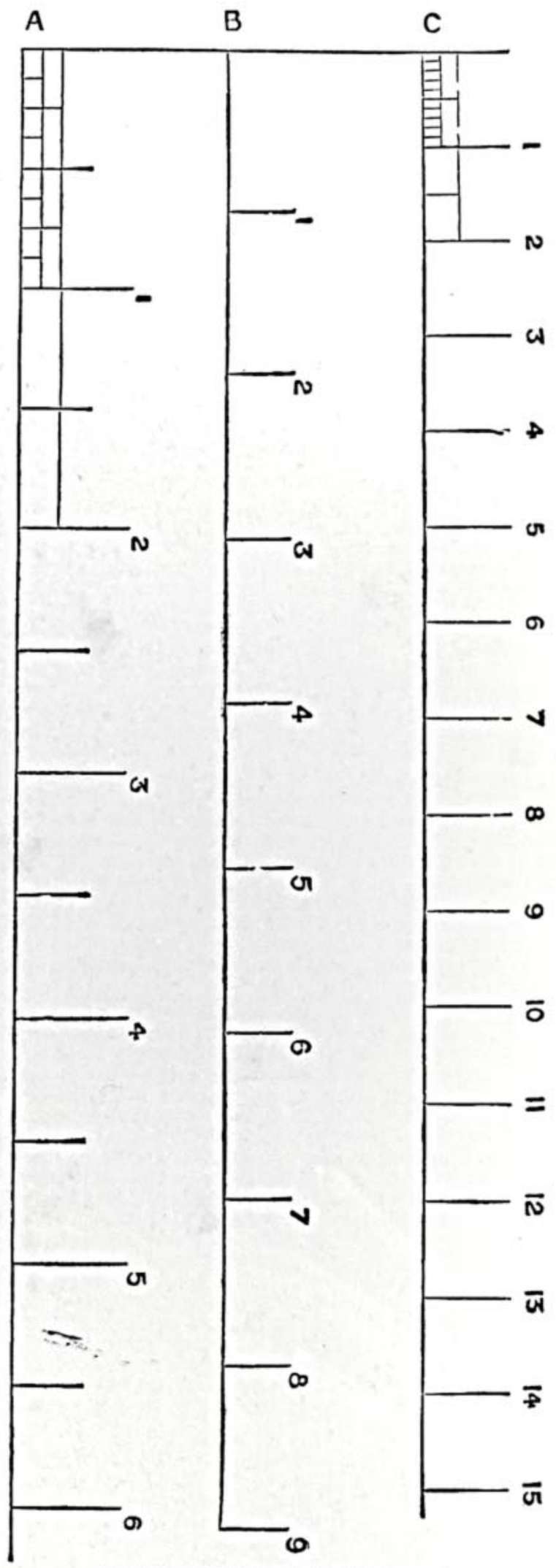
Wire for Coil.—PERPLEXED.—In the absence of a more definite statement respecting the construction of your coil, I am at a loss how to advise you. You omit to state whether or not you have an iron core inside the paper cylinder. The coil will be useless without one. You do not say how the magnet of your contact breaker is made. Have you coiled any of the primary wire on the legs of the magnet? If not, how can you expect the brake to move? The legs should be covered with one layer of the primary wire. Again, you have not stated the length of the core; but, although you have omitted this, I am sure you have too much primary wire. Two layers of No. 18 cotton-covered wire are quite enough for the primary; not 2 lbs., as you have, according to your letter. I have given in back numbers of WORK some hints to other correspondents on the construction of their coils. If you do not find what you want there, look out for my forthcoming articles on "Coils," and in them you will find full instructions. You should write as fully as possible when you make your questions.—G. E. B.

Foot Warmer.—H. J. (*Southampton*).—The reason the foot warmer collapsed was because it was not filled properly; probably it was only half or three parts full. If it had been quite full when screwed down, it is very evident that the sides could not have gone in, as they would have had nowhere to have gone to, water being compressible only to a very small extent, but if only partially filled there is a space left filled with air; this becomes rarefied with the heat of the water and so takes up less room, forming a partial vacuum. The pressure of the air on the outside then causes the sides to collapse. I have had lots of cases like yours, but the people have mostly owned that they did not fill them, not knowing that it made any difference. Tell your customer to fill it right up to the screw, and there will be no further trouble.—R. A.

Soldering.—INQUIRER.—In reply to INQUIRER, I must say that it will hardly be fair to others, as there is such a pressure on "Shop," and so many awaiting replies, to take up space in describing articles and giving instructions that have appeared in the body of the journal; if INQUIRER will invest 3d. in the purchase of Nos. 17, 23, and 32, he will there find all the information he needs; generally speaking, if any advice is wanted on special points, I shall be very pleased to supply it. A piece of advice to new subscribers: make haste and get the back numbers, and resolve to keep on with it.—R. A.

Pie-Making Machine.—W. W. (*Sunderland*).—I am truly sorry that I do not know of any such machine. If I might suggest such a thing, I should think a good wife was about the best pie-making machine to be had; but speaking seriously, if there is anything like what you want, you would get it from W. Kent, manufacturer of domestic machinery, High Holborn, London.—R. A.

French and English Measures.—J. W. Y. (*Loughboro'*).—One French mètre is equal to 39·37079 English inches, or 3·280899 feet, or 1·0936331 yards. As the mètre is thus rather over a yard in length, I do not understand your enclosed scale, which you say is "in mètres." The mètre is divided into 10 equal parts, called décimètres, each of which is



French and English Measures.

divided into 10 equal parts, called centimètres, which are further divided into 10 equal parts called millimètres. In the following table, A is divided into inches, B is your own scale, and C is divided into centimètres; and you will see that 10 centimètres (or 1 décimètre) are nearly equal to 4 in., being exactly 3·9371 in.—F. B. C.

Washstand, etc.—FURNITURE.—You will doubtless have observed, before you see this reply, that I have given designs of washstand and dressing-table to a previous querist. From your letter I should say that the same would just suit you. If, however, you do not care for one, or both, write again, stating whether you want an ordinary or elaborate design.—J. S.

Model Turbine.—NO NAME.—Before one can give you instructions on how to build a turbine of half-man power suitable for driving a dynamo, it will be necessary for you to give the volume and pressure of water at your command, since the turbine will have to be built to utilise your available supply of water. I must, however, leave this in the hands of another contributor, as it is out of my line of business.—G. E. B.

Soldering with Paquelin Lamp.—NO NAME.—The Paquelin lamp does not smoke the work in the least if it is not applied to the work till the flame becomes blue, which is about a minute after being lighted. This lamp has had some severe tests lately in our workshops, and the opinion we have of it is that it fully bears out all that is claimed for it. I am aware that the ordinary benzoline blowpipes smoke to some extent, but you will not find this the case with the Paquelin. In answer to your second query, I know of no other spirits that are satisfactary to use with blow-lamps than methylated or benzoline, but there is no need to use the former.—R. A.

Crucibles for Melting Brass.—H. H. (*Southgate*).—The small crucibles you speak of are made of plumbago. They are made under Morgan's patent by the Patent Plumbago Crucible Co., at their works, Battersea, London, S.E. The melting point of brass varies considerably, according to its composition, ranging from between 750° to 900°.—R. A.

Telescopes.—A. G. W. (*Bournemouth*).—I can't refer you to any book until I know more precisely what you want. You should frame a question containing details of the information that you seek with regard to the "making of a telescope," "the adjustment of the lenses," etc. If you do this I shall be able to help you.—E. A. F.

Etchings, Drawings, Lithographs, etc.—READER.—It is almost impossible to explain satisfactorily to you the difference between the various processes as desired by you, for even if I could show you examples of each, you would require experience to identify some of them at sight; but broadly, etchings are of two distinct sorts: some resemble pen-and-ink sketches, others water-colour drawings in sepia; they are known respectively as "au burin" and "eau forte." Oleographs represent colour-printed copies of oil paintings; chromos the same of water-colour drawings. Lithos, or lithographs, are prints made from a drawing on porous stones specially prepared, and may be printed in many colours or only one, according to requirement of artist; but most litho prints or lithographs have a woolly appearance. Litho tint mounts are mounts tinted by litho process. India paper mounts are distinguishable by the engraving being surrounded by a margin (say of 2 in.) of toned paper, mostly primrose or buff colour. Flock mounts are used by photographers, and resemble velvet almost in effect.—F. W. B.

Cleaning Brown Leather Belts.—T. R. (*Belford*).—Various compositions for this purpose are sold by saddlers, shoemakers, etc. Some recommend vaseline, but perhaps none of these will be much better than soft soap, which keeps the leather beautifully pliant; it must, however, be well rubbed off, or it will cause dust to stick.—S. W.

China and Glass Drill.—J. H. S. (*Wigan*).—Steel drills are of very little use in drilling glass and china. You need a special drill, or bit, which is made of a splinter of rough diamond cemented in the end of a round piece of tin, and which fits on to the end of a holder made on purpose for china drilling. You can buy both drills and bits ready made, or, if you have a lathe, can easily make your own. If you wish for directions, kindly let me know. I suppose you are familiar with making the rivets, and that it is only the making of holes which presents any difficulty? If there is anything further you wish to know, write again.—W. E. D., Jr.

Carving in Stone.—PRO RE NATA.—When you have read, as you should have done, the introductory paper on the "Mechanical Processes of Sculpture," which appeared in No. 53—the first number of Vol. II. of WORK—you will find that modelling in clay is the first step to the sculptor's art. Mere carving in stone, such as is seen in public buildings, large houses, etc., is carried out by the workman from rough drawings only, and not from a model made for the purpose, first in clay and then in plaster.—M. M.

Moulding Machine.—A. S. (*London, W.*).—Instructions on working a moulding machine are scarcely needed by a man who can work a planing machine, because their methods of operation are the same. The only difficulty lies in the shaping and tempering of the cutters, which is a matter of practice. The cutters are either milled or filed to shape, and tempered at a light straw colour, and a few days' practice should put you in the way of this. You will not get much help from books. Those of Powis Bale, "Woodworking Machinery," 12s. (Lockwood), and Richards' "Woodworking Factories," 5s. (Spon), are the best, but of little value from your point of view. Except that they possess some historical value, books of this kind are out of date in a few years, in consequence of the constant alterations and improvements being made in this class of machinery.—J.

Springs.—MARKAM.—If you want a small quantity only go to one of the Birmingham gun makers; if a large quantity, go to Jessop, of Sheffield. To temper, heat the spring to a bright red, and plunge into water. Then hold the spring over the fire to dry the water off, and dip into the fat of a tallow candle. Hold the spring in a clear fire, turning it about to warm it evenly until the oil blazes up, and then remove from the fire, and allow it to cool. —J.

Slide Valve.—F. C. (*Cardiff*).—I shall give in "Shop," as promised, dimensions, etc., of wooden model mentioned on page 822, Vol. I., of WORK.—T. R. B.

Time Indication Patents.—M. S. R. (*Barrow-in-Furness*).—Appointment indicators are patented and in use in the United States. In many offices and business places of New York they may be seen, with an attachment which simply rings a few

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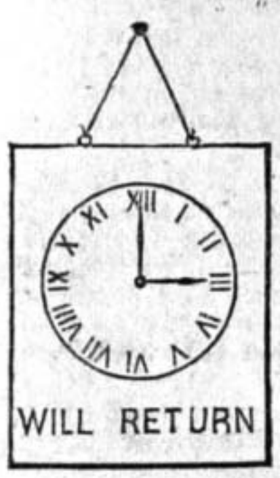
minutes before the hands near their destination, so that this gentleman has had the *same idea* as the American inventor (if he has not seen it previously). Such things do occur, for I thought I had invented a plan useful in another trade, but found it actually in use at Newark, near New York. So people have ideas in common. A silent one is largely sold and used over here. It is a dial of small timepiece size, with the hour and minute hands; and the party going out to lunch or any business, he has it hanging inside his glass door, and turns the hands to the time he will return, thus, 3 o'clock—much neater than the Liverpool or London way of affixing a written paper, thus—



Will Return to Office
3 o'clock—
Gone to Lunch.

I often meet this, especially with regard to small lawyers.—J. S.

Papers on Dynamos. — INVICTA (*Birmingham*).—It is just possible that this reply and the first papers on dynamos will appear somewhere in Vol. II. of WORK. The drawings are not to scale, but measurements are given in a set of tables, and castings of the various parts can be bought at a cheap rate. Directions will be given on making coils.—G. E. B.

Leclanché Battery for Small Electric Lights.—D. O. W. (*Ipswich*) writes:—"I have had a 2½ c.p. lamp to enable me to see the time at night for the last two years. I use twenty-five No. 2 Leclanché cells arranged in series of fives, and I get a good strong light, sufficient to see to do anything in a large room 22 by 17 ft., for between five and ten minutes. It may be longer, for I have never let it go its longest. The advantage of the Leclanché cells is, they are no trouble, give no smell, require no lifting, and are always ready. They may require a little water, say once a year." Many thanks for your little bit of experience. If you had a fewer number of cells, the lamp would not be so bright. Its efficiency proves that you have just the right number of cells and that they are properly arranged.—G. E. B.

Door for Greenhouse.—PHI.—Thanks for your criticism of the sketch, on page 812, Vol. I., of the method of making the joint of the belt rail for glass door; but, in consequence of your being in ignorance of the exact terms of the query to which it was a reply, your letter has really no bearing at all on the subject. The sketch simply showed the querist the method of levelling the rail and stile, in contradistinction to a proposed method of mitreing, and has nothing whatever to do with either the rebating or moulding, as you seem to suppose, both of which matters and their details being perfectly well understood by the querist. Of course there are many different methods of obtaining the same end in door construction, as in everything else, and I have always found that each workman thinks his own individual style the best, and all others wrong, although, as a matter of fact, one way is as good as another. Personally, I am cosmopolitan enough to believe all methods good if the result is a workmanlike job without a heavy expenditure of time, and hope that our "Shop" replies may tend to widen the ideas and broaden the capacities of all thinking readers. Perhaps the fact that the "intelligent comp.," in making up the column on page 812, in which the sketch appeared, turned the cut upside down without referring to the reading matter, has fogged you a little, for, as it stands, it shows the narrow part of the door stile at the bottom instead of the top, its proper place; but I daresay if you tackled the "comp." with the mistake he would shove it on to the "reader." I am glad you are so satisfied with the replies in the "Shop" columns, and hope that, with the rest of us, you may derive much benefit from them.—G. LE B.

Heating Greenhouse.—NO NAME.—Your idea of erecting a box outside your small greenhouse, and putting your lamp therein, is fairly good, and, if carried out as described, should prove quite effective. Make your box large enough to contain your stove, with a tin box or boiler on top, capable of holding about three gallons; run a piece of 1½ in. zinc tubing from your boiler round the interior of the house and back to the boiler; let the outlet end leave the boiler near the top, and the return end enter it near the bottom—this will ensure a slight circulation of the hot water through the tubes. You should have no difficulty in regulating the heat to about 50° with an arrangement of this kind, but see that you keep the boiler always full, and have an escape hole for any steam pressure that may generate within it, or it may prove a source of danger. The 1½ in. zinc tubing you can purchase, and, if you are handy with a soldering bolt, fit it up yourself.—G. LE B.

Ventilating a Greenhouse. — H. J. T. S. (*Guernsey*).—Without knowing the construction of your greenhouse, and your mode of heating it, it is rather difficult to give a definite answer to your query, but the following hints may be of service. As the heated air will ascend to the apex of the roof, it is there that you must make your arrangements to draw it off, and as the ordinary ventilating boards, or louvres, readily admit cold down draughts on windy days, I would advise you to discard their use altogether, and fix a ventilating cowl made of zinc in their place. There are many of these devices to be had, and one of the best is "Boyle's Patent." It admits no down draught whatever, and has a continual outward suction. You can procure these ventilators in many sizes, and can select one to suit. As to the inlet of air, to supply the place of that drawn off, you must be very careful so as not to have a rush of cold from the outside. If you can manage to cause it to pass under or over your heating apparatus before entering the house, it would be a great advantage, as then the chill would be taken off, and the risk of damage to plants lessened. Failing to accomplish this, you might try covering the inlet openings with the finest wire gauze on both sides. I hope these hints may prove serviceable to you, but if not, write again, giving more details as to the construction of your greenhouse, and your mode of heating it.—G. LE B.

Water Motor.—E. G. (*Leyton*).—A small turbine would probably suit your purpose; one of the form known as "Jouval's" would be fitted to the head of water at your disposal.—F. C.

Gold Leaf.—AMBITIOUS.—As from your letter you are not, apparently, used to the gilders' tip and cushion, it would be much the best for you to buy "transfer gold," as it is termed, in which a piece of tissue paper is inserted between each leaf, and the book having then been subjected to mechanical pressure, each leaf of gold sticks to the tissue, and is drawn out of the book affixed to the same. You can easily perform the transfer process yourself, by getting some white tissue and rubbing over the face of it, regularly, a piece of white wax—that used by laundresses is the best. Then cut your paper up and, lifting a leaf of the book at a time, place the tissue upon each leaf of gold. When all are inserted, subject the book to a little even pressure and your end will be gained. To question No. 2, 6d. per pint is usually charged; chemists may ask 8d.; shellac is about 1s. per lb.—F. P.

Spiral Springs.—T. J. (*Sedgley*).—You must certainly anneal your springs to cut them and then reharden and temper as you say, but the cost will be considerable. If you can do this you should be able to make the springs from the soft steel. You could make, or have made, a mandrel on which to coil them and cut them off hot; this would save the trouble of annealing. You might arrange with the spring makers to let you have the lengths of coiled spring unhardened, and cut them up and harden yourself.—F. C.

Bronzing Plaster of Paris. — RESTORER.—Figures cast in plaster must first be made non-absorbent before they can be satisfactorily bronzed. To effect this, if cheapness is a consideration, give the casting two or three good coats of warm patent size, and then try it with a coat of copal varnish. The latter will show by "bearing out" that the suction is stopped, or very nearly so, in which case the figure is given another bare coat of "hard drying" copal varnish upon which the dry bronze is rubbed with a little piece of wash leather. The size must dry hard between each coating, and the varnish for bronzing must be just sticky to the hand, but not at all wet. The best job is to use varnish diluted with a little turps instead of the size, as the former gives a harder surface. If the work is very delicate, mind in using size that you do not rub off the sharpness of the casting. For green, or copper, bronze effect, paint a suitable colour after sizing, then varnish and bronze prominent parts only.—F. P.

Ceiling Paint.—CONSTANT READER.—The difference in cost between painting an old wooden ceiling and whitening it only is very great. To properly paint it you would first have to wash off and scrape all the old whiting away from the wood, and then, when thoroughly dry, give it two coats of oily paint which need not be white. This would stop the suction of the wood, and you might then make a decent job of your ceiling with two more good coats of white lead paint. I am afraid painting four coats would be too expensive for you, but the following might suit your case. Thoroughly clean off the old accumulated whiting, and give two coats of white lead paint where the stains are, all over if necessary; this will kill the stain, and you will be able to make a nice white ceiling by distempering on the paint. The cheapest thing you might try, but which I cannot guarantee will be successful in your case, is to give the stained parts a thin coat of plaster of Paris and water, applied like distemper, with an ordinary brush. This will very often kill a stain in an old plaster ceiling; suppose you try it. Painting the stains is a certain remedy.—F. P.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. L. B. (*Oxford*); J. C. M. (*Bristol*); J. D. (*Belfast*); J. K. (*Manchester*); R. H. (*Sowerby Bridge*); NO NAME (*Sheffield*); P. F. (*Liverpool*); A. J. (*Faversham*); R. A. P. (*South Kensington*); T. K. M. (*Whitehaven*); R. J. A. (*Seacombe*); W. J. V. (*Penge*); G. B. (*Accrington*); JEWELLER; P. N. (*Halifax*); W. R. W. (*Poplar*); A. X. E.; D. F. (*Glasgow*); BETA; J. S. (*Heaton*); T. H. (*Walsall*); PERSEVERANCE; S. W. P. (*London, E.C.*); F. L. P. (*Whitworth*); G. W. (*Folkestone*); G. H. B. (*London, W.*); T. S. (*Spilsby*); T. H. B. (*Queen's Park*); CODGETO; W. J. W. (*Torquay*); W. P. (*Kingsland*); D. B. D. (*Glasgow*); E. H. B. (*Stoke Newington*); D. P. B. (*Truro*); ONE INTERESTED; R. B. B. (*Edinburgh*); J. P. (*Manchester*); W. H. S. (*Brockley*); W. B. (*Glasgow*); W. C. T. (*Birmingham*).

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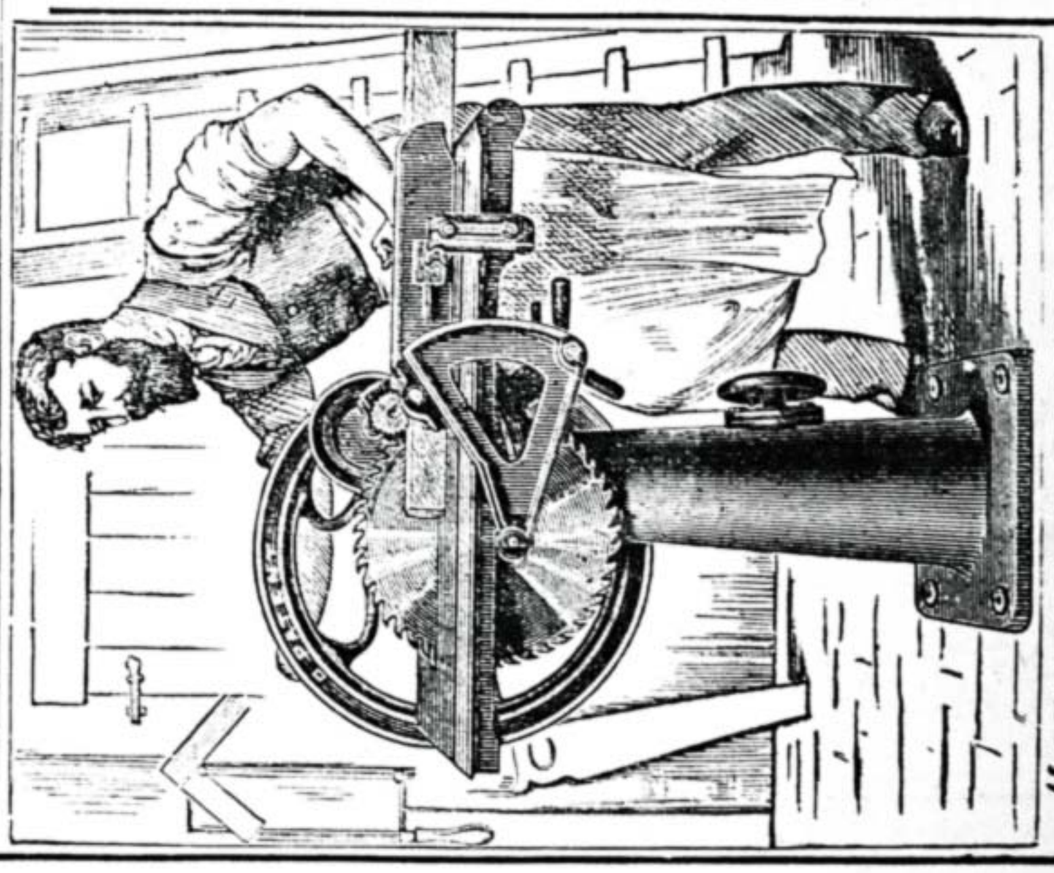

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LORD WOLSELEY, in writing to Messrs. Cassell and Company with reference to the forthcoming serial issue of their "BRITISH BATTLES ON LAND AND SEA," says:—

"The fool hath said, 'Happy is the nation that has no history.' A nation in such a condition is like an individual or a community that has no standard of morality. The young people of a nation with a glorious past are brought up to admire, and in admiring to try and imitate the noble deeds of former generations. Such a nation has a recognised standard of honour, a high level of patriotism for its sons to imitate. The legends of old which described the achievements of national—often only mythical—heroes were but the endeavour of wise men to supply the want of a glorious history to the race or state that had the courage and the manliness to aspire to be great.

"Books like that you have sent me are, to my mind, calculated above all things to make the British subject, indeed I may say the Anglo Saxon throughout the world, proud of his country, and anxious to emulate the great and noble deeds of his forefathers.

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